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THE SCIENCE OF MANURING.

Peradeniya, November 15, 1913.

In our September issue we stated that a belief prevailed that the science of manuring consisted of returning to the soil the ingredients removed by the products of the tree and that we were not aware upon what grounds this belief rested. The manuring of tropical plantation trees is a fascinating subject, the last upon which we should desire to express conclusions; but it is one which will demand and we hope will receive repeated attention in these columns. Our knowledge of the manurial requirements of plants was originally based upon experiments carried out with annual crops in a temperate climate; the whole of the crops being removed from the land, except in the case of pastures when the sheep or cattle are marketed. But even under these comparatively simple conditions it was discovered that though an examination of the ingredients removed was a guide as to what to return, it was by no means the whole case. This is well explained in an article we reproduce elsewhere from the GARDENERS' CHRONICLE of June 13, 1908. MCCONNELL in his "Agricultural Note Book," a publication that should be in the hands of every planter, after reviewing the ingredients removed per acre by crops and stock, states that "the method of giving the total amount of manurial ingredients removed by crop and stock is

the best;" and adds "but even the total quantity of each ingredient removed from the soil is not a correct guide to prescribing the proper kinds or quantities of manure for a crop." FLETCHER in his "Soils" states that "the chemical analysis of a crop is of very little practical value to the man who wishes to know what fertilizer to apply to that crop." Research, as far as it has gone, has shown that the "palates" of plants vary in unaccountable ways and that, to quote FREAM, "discoveries cannot be made in a week, or a month, as are made in electricity and chemistry; but, like those at Rothamsted, where the investigations were commenced more than half a century ago,* they can only be looked for even after the expenditure of much thought and of unflagging industry and perseverance, 'as the long result of Time.'"

If this is the case with annuals how much more must it be so with trees, and in the tropics? We remove the whole of a crop of wheat from the land but in the case of a rubber tree, for instance, we remove but a small fraction of its substance. The tree itself remains and continues to grow, requiring food for building up its tissue. In order that it may perform its functions properly—one function being, in the case of a rubber tree, the production of latex—its tissues and organs must be maintained in robust health. 95 per cent. of the food from which these tissues are built up is derived from the atmosphere. Important as it is to cultivate the soil, it is we believe of equal, even of greater, importance with tree culture in the tropics to exploit the food supply of the atmosphere.

To what xtent the one may take the place o the othe is a nice question for the investigator. We do not think that analysing th ingredients contained in the latex removed from a rubber tree would take us a great way towards the solution of that question.

R. N. L.

* Written in 1888.

THE LATE MR. JOHN FERGUSON, C.M.G.

The death of MR. JOHN FERGUSON is a serious loss to Ceylon. He was a living Encyclopædia, on everything pertaining to the Island and a recognised authority on its agricultural history. MR. FERGUSON took the liveliest interest in all agricultural matters, whether they affected the Colonial or indigenous population. He first arrived in the Island in the year 1861 to assist his uncle, the late MR. A. M. FERGUSON, in the conduct of the CEYLON OBSERVER newspaper and ultimately succeeded to the editorial chair. But in addition to his strenuous labours in connection with a daily paper he also found time to edit the well-known Directory that bears his name and the TROPICAL AGRICULTURIST magazine.

We are chiefly concerned with that phase of MR. FERGUSON's varied life which is connected with the welfare of the agriculture of the Island, and if he did nothing more than found the TROPICAL AGRICULTURIST his name would have gone down to posterity as a benefactor. But in addition to mere editorial enterprise, MR. FERGUSON was an eminently practical worker, and took an active part in promoting the best interests of our great agricultural industries. His sympathetic attitude during the coffee crisis is recalled by Colonists of an older generation, while his advocacy of railway extension to the hills as well as to the north-west of the Island has laid Up-country and Low-country planters under a lasting debt of gratitude to him as the champion of their interests.

As a public lecturer MR. FERGUSON did much in the course of his extensive travels to make Ceylon known to the people of other lands, not merely as a hunting ground for the pleasure seeker, but as a congenial home for the Colonist from the West.

The work which MR. FERGUSON has done for Ceylon will be appreciated more and more as years go by, but in agricultural circles he will always be remembered as the founder of the periodical which has united the whole tropical world.

We offer our respectful sympathy with the widow and sons and daughters in their loss.

THE PANAMA CANAL.

THE FUTURE OF TROPICAL AMERICA is the title of a book published by the Tropical Exploitation Syndicate dealing with Commerce and Agriculture in South America. Amongst the 42 illustrations in the Book is a chart of the world as a frontispiece which conveys in graphic form some idea of the important changes which will ensue on the opening of the Panama Canal. As a result of the opening of this Canal that portion of the rich tropical zone which is at present far distant will be brought comparatively near to Europe and the commerce of the entire tropical zone will receive an enormous impetus from the concentration of the vast amount of shipping directed through the Canal. Apart from containing useful information, the book deals with the products of the various states in the tropical zone, and we publish extracts dealing with certain products in other pages of this Journal.

RUBBER.

THE FUNDAMENTAL PRINCIPLES OF RUBBER TAPPING.

The earliest attempts to ascertain the fundamental principles which underlie the practice of rubber tapping were made by PARKIN in Ceylon and ARDEN in Malaya, and several of the conclusions which they arrived at have influenced subsequent theories and methods in a notable degree. But the work which these investigators initiated was not immediately followed up, and for some years afterwards experiments in rubber tapping were devoted chiefly to finding out how much rubber could be obtained from a tree per annum, regardless, in many cases, of the welfare of the tree. Indeed there were not wanting those who held that there could not be any definite principles, and that differences in tapping intervals and tapping systems were merely fads. However, it is becoming evident, from the more scientifically planned experiments which are now being carried out in various countries, that such a view is incorrect, and a comparison of the results obtained by different investigators will show that a general agreement on many points is within sight.

It has not however been generally recognised that PARKIN's results were based on "incision" methods, i.e., on the yields obtained from single isolated cuts. The Eastern plantation method of re-opening the cut, which probably more than anything else made plantation rubber a commercial possibility, was apparently introduced by RIDLEY, and it may be reckoned as the most valuable of the many contributions which the rubber industry owes to the late Director of the Singapore Botanic Gardens. But on the general adoption of "excision," the ideas derived from single incision tapping were transferred without question to the new method, and apparently it did not occur to anyone that they might not be strictly applicable. That omission has now been remedied by DR. A. W. K. DE JONG, who has re-investigated the foundations of our belief and furnished proofs of several propositions which have hitherto been taken for granted.

DR. DE JONG's tappings differed from estate practice in one respect only. In ordinary estate tapping, the length of the cut increases as tapping proceeds downwards, because the tapping surface is taken as half or one quarter of the tree and the breadth of that strip increases towards the base. In the experiments quoted below, the breadth of the strip tapped was kept constant throughout by marking two parallel vertical lines as guides at the beginning. That method obviates errors caused by the different increments in the length of the cut on different trees. The vertical strips were each tapped with one cut only.

PROBLEM 1.

Is the same yield obtained from two cuts of the same length and direction five centimetres apart, at the same height on the same side of the same tree? (*Fig. 1.*)

For this experiment 48 trees were taken. On six of them, the two cuts were placed on the East side, on the next six on the West, on another six on the North, and on another six on the South, in all cases to the left. The remaining twenty four trees were similarly tapped, but with the cuts to the right. The two strips on each tree were tapped for 9 months. Except in the case of one tree which gave thirty per cent. less from one cut than from the other, the yields of the two strips were practically equal. Omitting the yield from the abnormal tree, the yields of the two cuts were within 3 per cent. of one another, which is within the limits of error of the experiment.

PROBLEM 2.

Is the same yield obtained from two cuts of the same length and direction at the same height on different sides of the same tree? (*Fig. 2.*)

Twelve trees were tapped. On six of them, one cut was placed on the West and the other on the East, while in the remaining six, one cut was placed on the North and the other on the South. The East and West tappings were to the left, and the North and South tappings to the right. The trees were tapped on alternate days for three months, and then every day for four and a half months. The total yield from the East sides was 1·4 per cent. greater than from the West, and that from the North 3·9 per cent. greater than that from the South, i.e., the yields from the two cuts on opposite sides of the same tree were identical (within the limits of error).

This experiment was repeated on seventy trees which had been tapped some time previously on opposite quarters, the new cuts being placed on the untapped quarters. The cuts were placed east and west, north and south, southwest and northeast, and southeast and northwest respectively. The yields from the two cuts were again practically identical in five months' tapping.

PROBLEM 3.

Is the total yield from two equal cuts the same as that from a single cut of double the length on the same tree, the direction, and height from the base, of all the cuts being the same? (*Fig. 3*)

In the first experiment on this point, eight trees were tapped. The long cut was placed on the West side on all the trees, and the length was such that untapped strips about 5. cm. broad were left between the three tapped strips. Tapping was carried on for nine months, the total yield from the two short cuts being twenty per cent. greater than from the long cut.

The experiment was repeated on seven other trees, the long cut being placed on different sides on the different trees. Tapping was continued for nine months, the total yield from the two short cuts being 24 per cent. greater than from the long cuts.

Thus in both cases the long cut yielded less than two short cuts each half the length of the former.

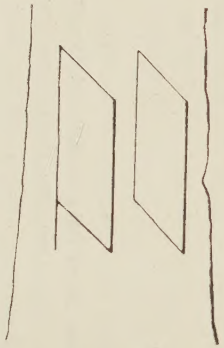

Fig 1

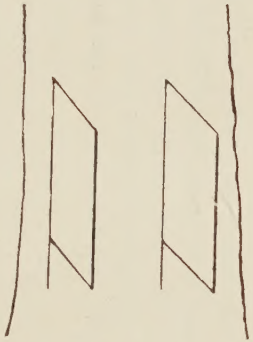

Fig 2

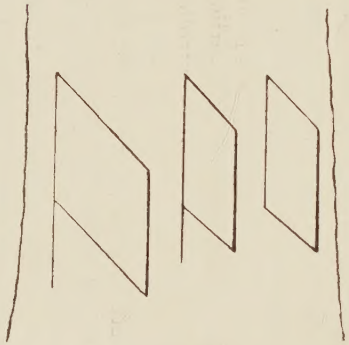

Fig. 3

Fig. 4

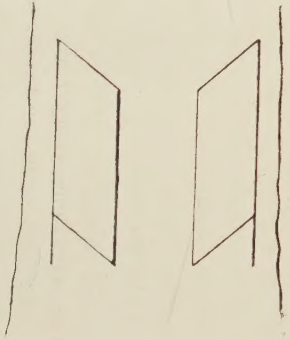

Fig. 5

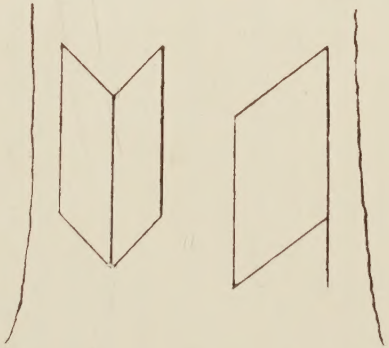

Fig. 6

Fig 7

It would seem to follow from this, that tapping on opposite quarters should yield more than tapping on half the circumference. This at first sight appears at variance with the published results of tapping experiments carried on for a longer period, in which opposite quarters yielded notably less than half circumference. On examining these experiments more carefully, however, it is seen that there is not a clear issue, since the methods of tapping on the different groups of trees have been varied. For example, in one experiment the tapping on opposite quarters is half herring-bone, while that on the half circumference is full herring-bone. It cannot be deduced from such an experiment that half circumference is better than opposite quarters, or that the full herring-bone is better than the half herring-bone. But granting that, it must be admitted that there is a marked discrepancy on this point between the results of "practical" experiments and those conducted under more rigorous conditions, and it would be unsafe to state that tapping on opposite quarters yields more than tapping on half circumference, until further investigation has been made. On theory it should, and in carefully controlled experiments in which the individuality of the tree is excluded, it does; but judged by ordinary tapping experiments where different groups of trees are tapped on the two systems it apparently does not. The explanation of the discrepancy has yet to be found.

PROBLEM 4.

Is the yield the same from two equal cuts 5 cms. apart at the same height on the same tree, but in opposite directions? (*Fig. 4.*)

This raises the question of right versus left tapping. 24 trees were tapped, each on two equal strips, 5 cms. apart on the same side of the tree, for nine months, the cut being to the left on one strip and to the right on the other. The yield of the cuts to the left was 14 per cent. greater than that of the cuts to the right.

PROBLEM 5.

Is the yield the same from two equal cuts at the same height on opposite sides of the same tree and in opposite directions? (*Fig. 5.*)

24 trees were tapped for 10 months, each on two equal strips on opposite sides of the tree, the cut being to the left on one side and to the right on the other. The yield of the cuts to the left was 11 per cent. greater than that of the cuts to the right.

PROBLEM 6.

Is the yield from a V cut the same as that from a single cut to the right, equal in length to the sum of the two arms of the V, the cuts being at the same height on opposite sides of the same tree? (*Fig. 6.*)

12 trees were tapped for 10 months, each on two equal strips on opposite sides, one strip being tapped by a V cut and the other by a single cut to the right. The yield from the V cuts was 16 per cent. greater than that from the single cuts. This is in accordance with theory, since a cut to the left yields more than an equal cut to the right, and therefore the V, being half left and half right should have an advantage over the single cut to the right. The contrary would be expected if the single cuts were to the left.

PROBLEM 7.

Is the yield from two single cuts, 5 cms. apart and in opposite directions, the same as that from a single cut to the left, of double the length, on the other side of the same tree, all the cuts being at the same height? (*Fig.* 7.)

Seven trees were tapped, each on three strips, one of which was equal in breadth to the other two together. The two narrow strips were placed on one side of the tree, and the broad strip on the other. One narrow strip was tapped to the left and the other to the right, while the broad strip was tapped to the left. Tapping was continued for ten months. With one exception, the short cut to the left yielded more than the short cut to the right. Taking the yield of the long cuts as 100, the yield of the short cuts to the left was 58·6, and that of the short cuts to the right 49·4. As before, the two short cuts together yielded more than the one long cut, in spite of the fact that one of the short cuts was to the right. It is rather to be regretted that this experiment was not made parallel to experiment 6 by the use of a V instead of two separate short cuts

RIGHT versus LEFT TAPPING.

That tapping to the left yields more rubber than tapping to the right was first demonstrated by MACADAM in 1906, but it was not until 1910 that an adequate explanation of the difference was suggested. It was then shown that in the majority of the trees examined, the wood vessels, and consequently the latex tubes, sloped up to the right, so that a cut to the left would sever more latex tubes than an equal cut at the same angle to the right. DR. DE JONG has completely investigated this point on ninety-three trees and has not found one in which the latex vessels, as a whole, slope in the opposite direction. Further, he has, on 316 tapping surfaces, determined the angle which the latex vessels make with the vertical, and has shown that the actual differences in yield obtained in his experiments by right and left tapping are accounted for, almost with mathematical exactitude, by the theoretical differences in the number of latex tubes severed by the tapping cuts which cross them at different angles. His results cover twenty pages of his pamphlet and cannot be quoted here at great length, but they afford a complete vindication of the superiority of left-hand tapping.

T. PETCH.

THE JAT OF PLANTATION HEVEA.

Correspondence has passed between the authorities at Kew, Kuala Lumpur and Buitenzorg (Java) in connection with the statements appearing in the report of the Akers Commission to the effect that the rubber planted in the Orient is almost entirely from seed of a "white" variety of Hevea brasiliensis, which, like the "red" variety, produces weak rubber, while the best rubber is produced by a so-called "black" variety, this growing on higher and drier land than the others.

Similar statements have appeared before, and they have been met and confuted by MR. WICKHAM's testimony that "the whole of the Hevea brought through Kew by me ..... were from the large grown trees in the forest covering the broad plateaux dividing the Tapajos and Madeira Rivers." (Para Indian Rubber, Wickham, p. 61).

This is conclusive as regards the Up-River origin of the seeds, but there exists a desire for information from the botanical side on the subject of the different "varieties" of Hevea, and it was this that led MR. L. LEWTON BRAIN, Director of Agriculture for the F.M.S., to approach the Kew authorities.

LIEUT-COL. D. PRAIN has replied as follows :—

Royal Botanic Gardens, Kew,
April 30th, 1913.

SIR,

I have the honour to acknowledge receipt of your letter No.382/1913, dated 1st April, 1913, on the subject of two statements made by a Brazilian Commission on the Rubber Industry, viz :—

(*a*) That the rubber planted in the Orient is almost certainly from seed of a "white" variety of Hevea brasiliensis.

(*b*) That this variety of Hevea brasiliensis produces a weak rubber.

2. It is to be presumed that whether it was or was not the intention of the parties making this statement to cause a certain amount of uneasiness among those interested in Eastern plantation rubber it would not be unpleasing to those interested in Brazilian rubber if the statement were correct.

3. You inquire whether there is any information from the botanical side which would tend either to support or discredit these two statements.

4. In reply, I have to observe that a feature of difficulty is imparted to the question by the use in the report of the Brazilian Commission of the term variety without any opportunity of learning what significance is to be attached to the term. If the Commission has employed this term in a scientific sense we are without any clue as to what characters have been relied upon by the Commission in distinguishing the three varieties they mention from each other. It is further to be noted that the Commission does not discriminate a "typical" variety, nor do they, as an alternative to this omission, state which of the three varieties *white*, *red* or *black* they would treat as typical Hevea brasiliensis. Their treatment of the question, however, is such as to lead to the conjecture that "variety" is employed in their report in a colloquial, as opposed to a scientific, sense and that the *white*, *red* and *black* varieties mentioned by you are in fact the "seringueira branca," "seringueira vermelha" and "seringueira preta" respectively of Brazilian travellers.

5. Assuming this to be the case we are informed (see DR. J. HUBER in Bol. Mus, Goeldi, vol. iv. p. 639), that the *white* and *black* "seringueiras" are botanically scarcely separable from typical Hevea brasiliensis, while the *red* "seringueira" represents the scientific variety of H.brasiliensis distinguished by HUBER as var. stylosa However, according to DR. ULE, there are two red "seringueiras." One of these is Hevea brasiliensis var. stylosa, Huber, and the other is Hevea cuneata, Huber; the latter is the Itaube of Brazil. DR. REINTGEN (in Tropenpfl. vol. vi Beih, no. 23 1905, p. 105) has stated that the *red* variety, or Itaube, is the most important and best known economically; DR. HUBER, on the other hand, declares that Itaube yields a product of less value than the *white* or *black* "seringueira." This latter discrepancy may indeed owe its existence to the circumstance that there are, as ULE points out, two quite distinct *red* "seringueiras" and that while HUBER had one, REINTGEN may have had the other in view.

2. However this may be, it is clear that the scientific botanists who are at work in Brazil have not yet been able to come to a common understanding as to the relative economic value and status of the three sorts of "seringueira" spoken of in your letter as *red*, *black* and *white* varieties. But the evidence, such as it is, points to only the *red* as being distinguishable botanically from typical H. brasiliensis. The *black* and *white*, so far as the available evidence goes, are not vareties in a scientific sense; they appear only to be different states of the same type, the particular state which is of most value being that which grows on higher and drier land than the other.

This last statement of the Commission thus qualified is in complete accordance with what has always been understood with regard to Hevea brasiliensis and we have no reason to doubt the strict accuracy of the statement (see Wickham, Para Rubber, pp.5 and 61), that the whole of the Hevea seed originally introduced to the East came from trees which grew under the conditions thus indicated by the Brazilian Commission.

I am, etc.,
D. PRAIN.

India Rubber Journal.

THE NOMENCLATURE OF RUBBER TAPPING.

In every new pursuit, whether in science, arts, or sport, the need of special terms to connote new ideas soon makes itself felt. It may be met by inventing new names, or by using everyday words in a special sense,—"polarising" them, as a well-known author has it—but whichever method is adopted it is essential for a complete understanding of the subject that the meaning of the terms employed should be accurately defined. The art of rubber tapping has now acquired its special nomenclature, and the majority of the terms in use are understood by rubber planters in all rubber growing countries, but there are still one or two which give rise to some confusion.

The first of these relates to the direction of the tapping cut. This is frequently designated as "tapping from left to right" or vice versa. The phrase is comprehensible if it is understood to indicate the direction in which the act of cutting is performed by the cooly, but it is ambiguous as denoting the direction of the cut, for a line which is "left to right" is at the same time "right to left" according to the way one chooses to traverse it. The ambiguity might be removed by adding the word "upwards" or "downwards," though the resultant phrase would perhaps be too long and clumsy for everyday use. The simplest way of avoiding ambiguity would seem to be to use the vertical channel as a reference line, and to refer to the cuts as "cuts to the right" and "cuts to the left" of the channel, or more simply as right-hand and left-hand tapping. These terms were proposed some years ago, and they have already been adopted in Java.

The use of the term "half spiral" is another feature of rubber tapping nomenclature to which exception may be taken. The original half spiral was quite different from anything in vogue at the present day. It arose out of the full spiral, apparently in the following way. The full spiral began

at a height of about six feet from the ground and wound round the stem until it reached the base. Now, if the cortex was at all uneven, it was impossible to carry the full spiral down to the base, and in such cases the cut had to be stopped and restarted lower down. Out of that grew the "half spiral" system, in which the spiral cuts were begun at various heights on the stem, and terminated after a length of two or three feet. The first cuts were begun at a height of six feet from the ground, but the lower cuts began and ended anywhere. Obviously such a method did not lend itself to systematic tapping, and it required a cup for every cut. Except in the case of a few specimen trees, it is doubtful whether it was ever attempted, and the system which is now styled "half spiral" bears no relation to the original. The present "half spiral" is really "half herring-bone," and to facilitate the interchange of ideas on rubber tapping it would seem advisable that the former misleading term should be dropped.

T. PETCH.

WHY ENGLISH MANUFACTURERS USE BRAZILIAN RUBBER.

The "LONDON AND CHINA EXPRESS" lately stated:—

"At present the manufacturers are content to use the Brazilian article because they have not to alter their mixing formulæ, which they are loth to do until they are certain of the qualities of the rubber used. Formerly they were not certain as to the supply; now they require a recognized standard of quality they can work to.

"The reason plantation rubber is not the equal of the wild rubber from a manufacturer's point of view lies in the different methods of curing these rubbers. It is the fact, too, that nearly every plantation company has its own ideas of preparing its rubber, whereas if all plantation rubber were prepared in a standard manner rubber manufacturers would be able much more readily to adopt their methods to plantation rubber than is at present the case."

It is stated that the Rubber Growers' Association expects, after a series of exhaustive experiments, that it will be possible to convince manufacturers that plantation rubber is equal to fine hard Para.—INDIA RUBBER WORLD.

THE RUBBER TRADE.

The Rubber market rules dull and lower, and a very serious contributory cause is the lack of confidence ruling in the American trade, where dealers, owing to the drop in prices, are prepared to do business only on a cash basis, an ominous sign which renders the market chaotic. It has also to be borne in mind that in order to supply the dividends paid by most of the companies, there has been very little, if anything, carried forward to provide for depreciation in value of produce, and in consequence consignments have to be sold on arrival in order to raise the working expenses of

the plantations. This may ultimately work out the salvation of a section of the trade from the fact that owing to the lack of necessary skilled attention consequent on attenuated means a large portion of the reclaimed plantations will rapidly go back to mere jungle, and in addition the rubber trees will fall victims to white lice and the other verminous diseases to which they are so subject, and this will mean hardship indeed for the man with a small capital who has invested his little all in concerns which at one time looked so promising. Let us suppose that the production from Malay and Ceylon this year totals 40,000 to 45,000 tons, next year the production from Malay alone will in all probability total at least 60,000 tons. To finance this huge quantity, even at the existing low values, a very large sum of available money is required, and considering that the trade at present is practically in the hands of a very few, surely the best way out would be to broaden the outlook by securing the co operation of wealthy merchants, dealers and brokers, and thus materially assist in the dispersing of supplies and easing the present financial strain. By this means the present period of depression may be tided over, otherwise the immediate future appears far from promising. We understand that about half a dozen new brokers, most of whom have until recently been attached to Liverpool houses, are opening in Mincing Lane shortly, and this is a pointer to the fact that the trade is leaving Liverpool and centralising in London.—LONDON COMMERCIAL RECORD.

MANICOBA RUBBER.

In a late number of the Bulletin of the Mexican Director-General of Agriculture, reference is made to a recent study by PROFESSOR ULE of two varieties of rubber :—

1. *Manihot dichotoma*—Manicoba—of the valley of Piauhy.
2. *Manihot piauhyensis*—Piauhy and Pernambuco, Brazil.

Commenting on this study, PROFESSOR DAVID THOMATIS expresses the opinion that these varieties are particularly suited to the tropical districts of Mexico. Their native habitat, in the Piauhy Sierra, is in rocky and stony soil, in argillaceous, sandy and gigantic sections, precisely similar to those of the Isthmus of Tehuantepec. The Piauhy Sierra is exposed to much wind, and the varieties mentioned are stated to be low in height.

GROWTH.

There is but little difference between the two varieties, the "Dichotoma," however, being the taller, reaching 40 feet, while the "Piauhy" never exceeds half of that height. It is thus better able to stand the wind, preferring sandy soils and resisting extreme dryness.

On the other hand, the "Dichotoma" prefers argillaceous and calcareous soils. With these new varieties, it is remarked, it will be possible to utilize locations with stiff argillaceous earth and with loose, dry and sandy soil. The saying that nature abhors a vacuum may be paraphrased as implying that she likewise abhors useless soil. It is for man to study how to utilize waste tracts, and in PROFESSOR THOMATIS' opinion, the varieties of rubber named, which are new to Mexico, will achieve that object.

Both of them shed their leaves during the dry season, when there is more wind, which, however, does not affect them much. They grow rapidly, attaining within the first four months about seven feet, with a trunk circumference of 6 inches, commencing to produce good latex in the third year.

CULTIVATION.

The simplest and most economical arrangement is to plant the trees about 8 feet apart, there being about 600 to the acre. This figure is about four times that usual for Ceara, Para and Castilloa.

In the first year, the plant assumes the shape of a single trunk, which forms in the second year two branches, each of which develops two secondary branches in the third year.

PRUNING.

At this stage, the four branches should be pruned, being left 12 inches in length. Pruning should take place shortly before the rainy season, during which many shoots or buds are put forth. In Brazil, instead of pruning these shoots they are allowed to grow, probably because in the forest conditions they do not grow close together, but at wider intervals.

Upon a systematic plantation, these shoots should be entirely cut every year, thus obliging the secondary branches to give birth to a new array of shoots. Through this annual pruning the ground gets more light and sun.

TAPPING.

All other varieties of rubber trees are tapped during the dry season. The latex is being formed all the year but becomes finally concentrated when the leaves are falling.

Dichotoma and *Piauhyensis*, on the other hand, require some moisture to develop their latex, and are therefore generally tapped during the rainy season. This fact is attributed to their being cultivated in a dry and well-ventilated soil. In the Upper Congo varieties resembling *Dichotoma* are tapped in both the dry and wet seasons. DR. THOMATIS recommends tapping during the dry season, accustoming the tree to develop and produce its latex at that period, when it would be of better quality and less resinous than at other times. He repeats that with these new varieties tapping can be commenced the third year, while six years is the age to be allowed for *Castilloa* and about ten for other trees. Each tree in these new categories can produce annually more than 2 pounds of latex, which will give 50 per cent. of excellent block rubber.* This, it is added, is twice the yield of any other rubber tree.

ADVANTAGES OF NEW VARIETIES.

To use the author's own words: "All these advantages represent large amounts saved in labour and materials for extensive plantations, and I would venture to say that in this way, if all the above points are taken into consideration, 50 per cent. of the expenses of tapping would be saved. It will easily be seen, that by cultivating these new varieties, the yield per tree only requires three years to be doubled. There are four times more trees to the acre and the expenses of incisions are reduced by one-half.

*Not according to our experience. Ed. T. A.

"In the same way as I recommended Mexican planters to cultivate our own *Castilloa* in preference to Ceara and Para, so do I to-day forcibly recommend the cultivation of these two new varieties. I have shown all the advantages as to soil, cultivation, tapping and yield. With these two new varieties there will be produced high yields of rubber in many large districts of Mexico where it has been impossible to cultivate other varieties to advantage. The subject appeals to the inhabitants and property owners of the districts along the Isthmus of Tehuantepec and the Pacific coast from Salina Cruz to Tonala."—INDIA RUBBER WORLD.

CULTIVATION OF RUBBER AT EXPERIMENT STATIONS.

It is recommended to follow in Brazil the policy at first adopted in Ceylon, of being guided by the results shown by the experiment stations before planting on a larger scale, says the INDIA RUBBER WORLD. Trials should be conducted for several years and the results compared with those of the Far East. In the establishment of these experiment stations it is suggested that an examination be made of the chemical composition of the soil as well as of the drainage. The latter point is indispensable for the successful cultivation of Hevea in view of the height attained by the waters of the Amazon during the rainy season. Another subject of investigation should be the supply of water available in the dry season.

CASTILLOA RUBBER IN DOMINICA.

By JOSEPH JONES AND A. G. JONES,

Recently, investigations respecting the genus Castilloa have been undertaken by the United States Department of Agriculture and by the United States National Herbarium, with the result that, instead of the three or four species of this genus which were thought to exist, the number has been raised to ten or eleven. Until a short time ago, it was thought that only one species was being grown in the West Indies, namely *Castilloa elastica*; but as a result of the investigations mentioned, it has been ascertained that three, and possibly four, species are at present under experimental cultivation in these islands.

TAPPING.

The method used in Dominica for tapping the Castilloa trees is very similar to that in common use on estates in Trinidad and Tobago. A thin chisel about $1\frac{1}{2}$ inches wide is used; this is carefully tapped with a

hammer, care being taken not to strike it too hard. The cuts are made in perpendicular rows about 8 inches apart, each row about 4 inches from the other. The second row is made in the interval between the first and the third. The latex, which comes out in a fairly thick mass, collects around the cut, the accompanying black fluid flowing down the stem. The latex is then taken up with a spatula made of bamboo, put into small cups and transferred to earthenware vessels. In this way the trees are thoroughly tapped all round the stem in three or four operations. The trees may be tapped to any height. It is the custom in Dominica to bleed the older trees to a very considerable height, using a ladder for the purpose. The younger trees are operated on only to a height of about 6 feet from the ground.

By this method of tapping the injury to the tree is not very great, and though far from perfect, it seems the most suitable at present.

PREPARATION OF THE RUBBER.

The latex collected in the earthenware vessels is brought in and diluted with clean water. It is then passed through muslin to remove impurities such as bark and dirt. The clean latex is now transferred to wooden buckets fitted with wooden stopcocks at the bottom. Each bucket contains only about one-sixth its volume of latex; they are then filled with water, preferably hot, a few drops of formalin is added and latex is allowed to cream. The creaming takes place quite rapidly if sufficient water has been added. The water is withdrawn from below and a fresh supply added and again mixed with latex. This process may be repeated three or four times until the water withdrawn is quite clean. Sometimes, the latex coagulates of its accord in the bucket. Should coagulation not take place after the final lot of water is withdrawn the thick cream is transferred on to a piece of muslin, and the water allowed to drain. After a few hours, a spoon may be used to bring the latex together, which with very slight working coagulates. The soft coagulated mass is well washed, and then placed between two boards and pressed to the required thickness, about $\frac{1}{8}$ inch. A very considerable pressure is sometimes required for this; there was only available for the purpose a disused letter press and this accounts for the somewhat unfavourable report of the experts at the recent Rubber Exhibition : some of the samples were reported upon as being uncured. The pressed rubber cakes are again washed and placed in a cool, dark place to dry.

The whole process, from the extraction of the latex to the preparation of the biscuits, need not take more than twenty-four hours, and the sooner it is completed the better. The rubber obtained is at first perfectly white, provided everything is kept scrupulously clean; on drying it changes to a brownish colour.

A sample of rubber prepared as detailed above was forwarded to the Government Laboratory, Antigua, for analysis. It gave the following percentage results calculated on dry rubber : Caoutchouc 85·4, resin 11·9 proteid 2·6, insoluble matter 0·0, ash 0·0.

The report further stated: 'The colour of the sample was very good as also were its elasticity and tenacity.' As will be seen from the above, the resin content is somewhat high. In this connexion it may be stated that an experiment was conducted with the object of reducing the percentage of resins by washing the latex with a dilute solution of caustic soda. A sample of each was again forwarded to Antigua, but MR. TEMPANY states in his report: 'Treatment with caustic soda appears to have had relatively little effect on the character of the sample.' The one washed with the soda contained 12·1 per cent. of resin and the unwashed 12·65 per cent. Further experiments with varying quantities of soda solution, are needed in this direction.

YIELD OF RUBBER PER TREE

Having described the method of tapping and the process of preparing the rubber, there remains now to consider the yield obtained per tree. This is perhaps the most important factor of all.

Prior to April 1911, chiefly owing to the difficulty encountered in coagulating the latex, no records were kept of the yields obtained per tree, or per set of trees, in Dominica. Since then, however, the trees have been tapped regularly every three months, and the rubber weighed. It should be stated that all the trees were thoroughly tapped during February of this year, and the rubber shown at the Rubber Exhibition. They had had, therefore, close on three months' rest before they were tapped the following April.

The Castilloa trees at the Botanic Gardens, for the purposes of tapping experiments, may be conveniently divided into three sets: (1) Four trees, twenty years old, having a girth at 3 feet from the ground of 7 feet 4 inches; (2) nine trees thirteen years old, with an average girth of 37 inches at 3 feet from the ground; (3) thirty-seven trees, twelve years old, with an average girth of 36 inches at 3 feet from the ground.

The first set of trees, four in number, were tapped to a very considerable height with the aid of ladders. In April they together yielded 1 lb. 13 oz. of cured rubber, in July 1 lb. 5 oz., in October 1 lb. 7 oz. and in January 1912, 1 lb. 2 oz. The trees in one year with four tappings have yielded 5 lb. 11 oz. of rubber or a little under 1½ lb. per tree.

The second set of trees, nine in number, owing to their smaller girth were only tapped to about 6 feet or a little higher. They together yielded in April, 0 lb. 8 oz., in July 0 lb. 7½ oz., in October, 0 lb. 3½ oz. and January 1912, 0 lb. 5 oz. The nine trees in one year with four tappings have yielded 1 lb. 8 oz. or 2·7 oz. of rubber per tree.

The third set, thirty-seven trees, were also tapped only to a height of 6 feet. They together yielded in April, 2 lb. 14 oz. in July, 1 lb. 3½ oz. in October, 2 lb. 1 oz, and in January 1912, 1 lb. 8 oz. In one year with four tappings they have yielded 7 lb. 10 oz., or 3·3 oz. of rubber per tree.

RESULTS FROM EIGHT QUARTERLY TAPPINGS.

No. of trees.	Age, years, 1912.	Average girth 3 feet from ground				Actual yield in four quarterly tappings.				Average yield per tree during				Average annual yield over two years.	
		1911.		1912.		1911.		1912.		1911.		1912.			
		ft.	ins.	ft.	ins.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
4	21	7	4	7	6½	5	11	2	11	1	7	0	10¾	1	1
9	14	3	1	3	4½	1	8	0	8½	0	2·7	0	1	0	1·8
37	13	3	0	3	6	7	10½	2	8	0	3·3	0	1·1	0	2·2

THE SPINELESS CACTUS.

TO THE EDITOR OF THE "TROPICAL AGRICULTURIST," PERADENIYA.

SIR,

This really wonderful plant is not yet much known and it would prove invaluable to stock owners and others, more especially in poor or dry districts, where vegetation of any kind is grown with difficulty. It is easily grown from the heavy leaves or slabs in any class of dry soil, and after the first year will yield according to conditions from 100 to 200 tons of succulent and nutritious fodder which can be fed to all kinds of stock and more especially dairy cattle. By analysis one ton thereof is equal in feeding value to three-fourths that of lucerne which is the richest fodder plant grown. During the hot summer months this plant would be luxuriant and being of a rich juicy nature would also greatly allay thirst and would therefore prove the salvation of stock owners. Some of the species yield 8 tons of well flavoured fruit per acre which makes excellent jams and jellies, etc., and growers have made up to £160 per acre. The young fleshy leaves are a good and wholesome vegetable when fried like egg-plant or boiled as greens, etc., and they also make good pickles. This very useful plant should prove a very great boon to residents in the East Indies as not only is it the heaviest yielding fruit and fodder plant yet known, but it will thrive where hardly any vegetation will exist and requires but little attention. Stock owners particularly would find it useful.

Yours very truly,

B. HARRISON, F.L.S.

Burringbar P.O.
N.S.W.
Australia.
14 September, 1913.

COCONUTS.

COCONUTS IN FIJI.

In the last issue of this Journal we published some useful notes on coconut growing from the pen of MR. H. H. THIELE, Secretary and Editor of the FIJI PLANTERS' JOURNAL. The account reproduced below is in continuation of the previous one. MR. THIELE states:—There is an opinion generally held that by analysing a soil intended to produce a certain plant, and knowing what that plant's chemical requirements or constituents are, you can tell exactly what manure should be used. This is, however, only true to a limited extent, and the reason in many cases is simply this, that although a certain necessary ingredient is present in the soil in quite sufficient quantity, as shown by the analysis, it is not in such a condition as admits of its assimilation by the plant. There are remedies for such cases and they are fully described by MR. GUTHRIE in an article which will appear in the PLANTERS' JOURNAL.

My advice is that until you have ascertained for a fact what kind of manure your soil requires, when, and in what quantities it should be applied you had better at present limit yourself to experiments only, and not waste a lot of money on guess work.

What is written above applies to chemical manures. Bonedust and Dried Blood have given very satisfactory results in other places. I would not recommend them here. I tried them in my vegetable garden, with the result that all the crabs and ants from the neighbourhood congregated there for a feast, and I got very few vegetables. The ants walked off with the Bonedust—I do not believe that I benefited by it at all.

MANURING.

As regards green manuring, I am in favour of it for any kind of crop; but I have not tried it on coconuts. It presupposes to a certain extent the possibility of being ploughed in, or otherwise covered with soil, and this could not be done in the estate I managed. Cowpeas will probably answer best in Fiji; they grow up straight, may—if so wanted—be cut off for cattle food, and the peas are liked by the Indian labourer and fowls. Beans—such as Mauritius, etc.,—are likely to injure the young plants by climbing up their stems and lashing the tender leaves together. There is another leguminous plant growing profusely amongst the coconuts in most parts of Fiji—its local name is ka-moce (Cassia optusifolia). It most likely does benefit the trees to some extent, but as a fodder plant it is useless and only takes up the room of much better grasses or plants. I have heard the statement made that if ka-moce is pulled up and allowed to dry on the ground for two or three days the cattle will eat it. It is very difficult and expensive to get rid of. Of late years the sensitive plant (Mimosa pudica) has been introduced largely on coconut plantations. It is good for the trees and, if once accustomed to it, the cattle come to like it, and thrive well on it. It stands drought well, and its only drawback is that it is covered with small prickles.

The grazing of cattle on a coconut plantation is not likely to do much good as far as manuring the trees goes. Only a certain number of cattle can be kept on a certain area of grass, and the quantity of manure produced by that number is quite inadequate to affect the trees to any appreciable extent. Some planters in other parts of the world are much against allowing their cattle amongst the coconut trees at all. An old Ceylon planter says: "It is hardly possible to obtain from any source a sufficient supply of dung to materially increase the general yield of a coconut field." To apply a liberal quantity of cattle manure round young trees has done a lot of good in some places. I would not advocate its being done here in our hot climate; it might increase the temperature of the soil at first and afterwards form a breeding place for beetles and other objectionable insects.

Here in Fiji the planter makes a good profit out of his cattle. He must provide them with food, so he sends them amongst his coconut trees when these are so old (say about 5 years) that the animals cannot injure them by getting at and pulling out their tender centre shoots.

As no coconut cake is produced here or imported, there has been no chance of experimenting with it as a manure, but in other places it is much recommended for the young plants. Here I think the rats would eat it.

The question of letting other useful plants grow between the rows of young coconut plants is one which requires careful consideration and must greatly depend upon the locality and the nature of the soil. To allow the original bush to shoot up again round the young plants is decidedly wrong; this had been done with a block on the place I was managing at Taviuni, and, when the bush was cleared away the second time, some of the young coconut trees tumbled over; they had hardly any hold in the ground, and, with their long fairly healthy looking leaves, could not at first stand up against an ordinary strong wind. I must, however, say the varas had been planted very badly; in some instances it looked as if no holes had been dug at all for them. The sun and wind should not be excluded from the young coconut plants and a continually increasing space round them, according to their age, kept clear of weeds.

Where the nuts are planted about 30 feet apart, I can see no objection to using the space between the rows for some other useful plants, such as bananas, yaqona (Fiji grog, Piper methysticum), tobacco, maize, etc., the profits on which will help the planter to meet working expenses; but if cotton, cacao or sisal hemp are to be cultivated for a permanency on the same piece of land as coconuts, these should be planted some 40 feet apart.

When it is intended to use the land for pasture, some kind of good fodder plant or grass should be established towards the time when cattle may be allowed amongst the trees. The sensitive plant (Mimosa pudica) is at present in great favour in Taviuni; it has stood a good trial, and given satisfaction everywhere. It should be kept short or the stems become wooden and the prickles on them harder. The drawback to it are its thorns, which make it necessary for labour working in it (collecting nuts) to have their legs in some way protected. There is a thornless variety of the sensitive plant in Queensland, but it is very little known in Fiji. I am told it is more delicate than the common kind, also that it has in some places been known to revert to the thorny condition.

Guinea grass is much recommended by Ceylon planters. It grows well in Fiji.

Paspalum was also introduced to Fiji some years ago; but, in the opinion of planters with the longest experience of it, it is decidedly injurious to the coconut trees and should under no circumstances be planted amongst them. I had it growing in a 6-acre paddock for about four years—after which time I left the plantation—and up to the end of that time I could not detect any bad effect on the coconut trees. What may have happened later I cannot say. The description of the soil must be taken into consideration when choosing what to grow for your cattle.

GATHERING THE NUTS AND MAKING COPRA.

As far as I can learn from different publications the process in most countries is to let the labourer climb the trees, throw down the ripe or nearly ripe nuts, gather and transport them to a shed near the homestead, unhusk the nuts, split them, cut out the copra and, in most estates of any size, extract the oil from it. I do not think this course of proceedings is pursued in any part of Fiji.

Here we let the nuts fall to the ground, when they are ripe enough, collect them in heaps, split them and cut out the copra, carry it to and spread it on the vatas : two well filled bags constitute an ordinary task for a man.

The vatas are the platforms on which the copra is spread out for drying. They are usually wooden frames with reed bottoms, and when rain comes on the copra is covered with old galvanised iron, canvas or coconut leaves. On larger and better provided plantations the vatas are usually wooden platforms on wheels moving on rails and can be run under a shed when rain comes on and at night time. The object of the planter who sells in the local market appears to me to be to produce an article just good enough to secure the advertised market price. There is really no encouragement here to produce an extra fine article, the merchants will not pay any more for it though they are not adverse to reducing the price for indifferent copra. Whether it would pay the merchant to grade his copra into two or more different lots according to quality, I cannot say ; but I am pretty well sure that if copra of different description is placed in one heap or bulk the bad kind will have a more deteriorating effect on the good copra than the latter will have in improving the former.

Results are better when planters themselves ship through to the Colonies or Europe ; and even then the market price quoted for South Sea Island copra is almost invariably lower than that paid for copra from any other place, and generally some £3 or £4 less than Malabar and Ceylon copra fetches.

What is the reason for this state of affairs ?

Who is to blame, the planter or the merchant ?

The answer to the first question is simply this : that Fiji copra as now put on the European market is the poorest article offered there, and consequently is paid the lowest price. The answer to the second question is not so obvious. The planter, or producer—especially if a native or Indian—has not, as a rule, the proper appliances for making good copra ; weather also may be against the work and the copra may have to remain in the vatas for a considerable time before it is dry enough and then it has turned a very dark

colour. Such copra, when pressed, gives only an oil of bad colour and poor quality. The local merchant takes it, not from choice in many cases, but because he has supplied the owner with goods on credit, and this is the only way in which he can get payment. For the merchant to send such copra to Europe or the Colonies would not come up to expectations, so he mixes it with some of better quality. The planter himself will do this if he is fortunate enough to be able to. The result of this is indifferent copra, and the blame lies with the merchant as well as with the planter, but mostly with the former. All planters cannot always produce good copra, but the merchant can always grade it if he likes—and thereby demonstrate that some really good copra can be obtained from Fiji as well as from other places.

To make the copra in the field, as is done in Fiji, saves transport—there can be no doubt about that point ; against it remains the fact that it is not always possible to prevent the copra from getting wet while being made or before it can be brought under shelter, and that means deterioration. When bringing in the nuts and heaping them in a shed near the homestead you can choose a favourable time for extracting the copra, that is to say, within a few weeks, and before the kernel begins to undergo alterations previous to the sprouting. It is also more convenient and less expensive to husk the nuts at, and ship the fibre (coir) from, the homestead, than if the husking is done in the field. As no coir is made in Fiji at present the latter point is not of any importance. When artificial heat is used for drying copra the hard shell of the nut is generally used for fuel. Here in Fiji the shells with the husks are left in heaps in the field where the copra was cut, dried leaves fallen from the trees are piled on top and the whole lot burned, the ashes serving as manure.

With a fresh wind and good sunshine two days' exposure of the green copra is generally reckoned sufficient time to dry it in. It is then put in a heap in the copra house to await shipment. Further loss in weight takes place here, and some 40 per cent. is lost altogether in the drying process. Drying by artificial heat is not done in Fiji, except on the island of Rabi as far as I know. The copra can be dried in that way in much shorter time than by ordinary method. I read in a book ("The Consols of the East") the other day that the highest priced copra was obtained by drying it in the sun for six days.

In cases where the copra and coir is sent away, and the shell used for fuel, and consequently nothing returned to the land, it becomes absolutely necessary to apply some kind of manure in order to maintain the productiveness of the soil.

It appears to me an anomaly that the owner of one of the largest coconut plantations in Fiji, on which is also a dairy of very considerable size, sends all his copra away, when he might extract the oil, export that, and use the poonac (coconut cake) for feeding the dairy cows with. Denmark could not produce butter of such superlative quality without using poonac for the milking cows. An experiment has shown that by adding 21 ozs. of poonac to the ordinary daily food of a cow, which produced $28\frac{3}{4}$ lb. of milk containing 16 ozs. of fat, the yield was increased to $35\frac{1}{2}$ lb. of milk (an increase of 23·5 per cent.) containing $20\frac{1}{4}$ ozs. of fat (an increase of 26·5 per cent). It has also been ascertained that the better keeping quality of the Danish butter compared with that of other countries is to a great extent due to the poonac given to the dairy cows.

ARTIFICIAL DRYING OF COPRA IN THE WEST INDIES.

The coconut is an important product of many tropical countries and is being planted more extensively every year.

It is estimated, according to the Bulletin of the Pan-American Union, that the annual export trade of Central and South America in all products of the palm is valued at $1,950,000, that of the West Indies at $1,100,000. In Jamaica, it is said that there are 15,000 acres under cultivation in coconuts, with an annual export of 12,000,000 raw nuts, and that in Trinidad there are cultivated 5,000 acres with an annual export of 9,000,000 nuts.—BULL. No. 71. AGRIC. DEPT. OF TRINIDAD & TOBAGO.

COCONUT CULTIVATION IN TROPICAL AMERICA.

PANAMA.

In speaking of the physical features of Panama we quoted the opinion that the land furnished the finest possible ground for coconut plantations.

According to the British Consular reports, "the San Blas" (on the Atlantic) "nuts rank higher in the New York market. The Smithsonian Institute at Washington have pronounced them superior to any on the European or American markets."

Plantations have recently been started, one at Nombre de Dios, on the Atlantic coast, and another near the Pacific entrance to the canal.

"Cacao and coconuts are the most profitable tropical crops. A few thousand dollars spent in a plantation will, ten years later, yield an income largely in excess of the original investment. . . . . A man may easily make a living out of sugar or bananas while awaiting the maturity of his more valuable product" (Forbes-Lindsay).

COSTA RICA.

As is the case with other countries of Tropical America, there is wide scope for the profitable prosecution of the coconut industry, which, so far, has received little attention. There is before the writer a lengthy report upon an uninhabited section of the coast of Costa Rica, where were found 153,000 coconut palms in bearing, and 260,000 trees not yet mature. The report states :—

> "There is no indication of habitation. Here and there are some traces, almost obliterated of 'blazing' in the forests near the shore, having been made to cut off the promontories which break the coconut groves, which marks the intrepid steps of someone who has reached the groves and picked a little of the abundant crops that they produce.
>
> "There has been no change in these lands from primeval days to our own times, and, as regards the richness of their fauna and vegetation, anything possible said in their praise is but little, an

immense region affording every kind of climate, and fitted for every description of agriculture. The quality of the soil could not be better, and a deep vegetable sub-soil on which any description of agriculture can be undertaken without trouble. Water in abundance, immense level grazing lands, covered with natural pastures; solid dry lands without swamps, without mosquitoes. All this guarantees a continued healthiness. I can vouch for all this since I covered it on foot, with nine companions, along the coast, and in these long and trying days, tramping without roads and any comforts to help us, we did not have the slightest indisposition. I am sincerely of opinion that, on the date that this magnificent region has communication with the rest of the country, we shall find therein inexhaustible founts of richness. The coconut groves in places form a regular jungle—one palm close to another—from the seedling to the full-grown palm. However, this, which is a disadvantage for the moment, really constitutes an immense advantage for future exploitation, since the younger trees can be transplanted without any difficulty at a small expense. I estimate that there are a minimum of 150,000 coconut trees in production, at least 250,000 between two and four years old, and a million young plants is a low figure.

"There is an abundance of palms loaded with an enormous amount of fruit (some that I counted had more than 200 nuts)."

Costa Rica, speaking figuratively, is a gold mine, the surface of which has hitherto only been scratched, but to which the coming of the Panama Canal will bring capital and machinery to develop its riches.

NICARAGUA.

Coconuts which cover the islands and reefs lying off the Atlantic shores, and by their presence are evidence of the suitability of the climate and soil of the Atlantic border for their cultivation. As a systematised industry, coconut cultivation hardly exists, and the exports, which are from the Atlantic ports only, were (1910) insignificant. There seems to be no reason why this tropical culture should not be established upon up-to-date and scientific principles, to the great profit of any Company with sufficient financial strength to do so.

REPUBLIC OF HONDURAS.

The coconut groves of Puerto Sul extend from the Ulua River to the Cuero River, a distance of about 60 miles, and may be mentioned chiefly as evidence of the possibilities of the soil for growing this important tropical product. The fertility of the soil has already been referred to, and the other conditions of rainfall, temperature, etc., are all entirely suitable for planting. In the last ten years for which statistics are available the value of the export of coconuts practically doubled itself.

BRITISH HONDURAS.

The conditions of soil, climate, and rainfall, of which particulars have already been given, indicate British Honduras to be a suitable ground for coconut planting. As shown by the exports of over five million coconuts in 1911, it is an improved industry in the Colony, and sufficient has been done to prove that judicious coconut planting may be successfully carried out.

The export of five million nuts, representing barely 1,000 tons, can hardly be regarded as more than tapping the capacity of the country. Systematic exploitation would certainly make it profitable to spread plantations over a large area.

GUATEMALA.

Of all the products for which Guatemala offers entirely suitable conditions, it is probable that in the end the coconut palm will prove the most remunerative to the planter. Large quantities of the palm are found in many parts of the country. It would seem that every condition for the successful cultivation of this valuable palm exists in the fertile plains. Proximity to the sea, which, while not an essential, is so important a condition for producing a full crop, is continuous along the whole coast, east and west. The rainfall is sufficient; there is ample scope for the selection of soil precisely suitable for the best results without the addition of artificial stimulants, and the tropical temperature is what the nut requires to develop its full value.

A qualified expert, writing in the beginning of the present year 1913, makes the following interesting remarks :—

> "I have made two journeys to Guatemala, and have ridden the tropical belt on the Pacific coast from San Jose to the Mexican frontier. In every village I found coconut palms growing profusely, and believe that they can be cultivated easily. At different places the rancheros had planted coconut palms, which were growing well, and indicated that the conditions would be suitable for planting coconut palms in large numbers."

VENEZUELA.

The planting of coconuts is being actively pursued along the coast and the production of the valuable fruit is already considerable. One planter alone cropped some 2,000,000 nuts last year, and not only is there ample scope for the considerable extension of this industry, but heavy planting is proceeding by those who appreciate its importance.

BRITISH GUIANA.

The wonderful fertility of the soil in conjunction with the ample and regular rainfall and the tropical temperature, should render large areas, particularly those on the coast line, peculiarly suitable for coconut planting. The acreage under the cultivation of coconuts was (in 1910) some 10,000 acres, but there are not wanting signs that in the near future large additional areas will be planted with this remunerative commercial product. The acting Governor in his last report states that there is "a vast area of land suitable for the planting of coconuts, and, given proper cultivation and drainage, could be very largely increased."

MR. JAMES RODWAY, previously quoted, bears evidence to this : "The coconut grows well on the coast, where it is all the better for a little salt. It seems to revel in the sea-breeze, which braces it in a manner peculiar to itself."

"Several plantations and one oil and fibre factory already exist in British Guiana.

"There is great room for development, and there are signs of an increase not only in the exportation of nuts, but copra as well.

"The more carefully prepared desiccated coconut, now largely used in confectionery, could also be produced here, as well as mats and other fibre products."

"The area planted in coconuts," says PROFESSOR HARRISON (1907), "has been steadily increasing for some years past, while of late years a marked tendency has arisen for planting them. In fact, since 1902 a very rapid increase in the area planted has taken place. The great majority of those grown are utilised in the Colony for the preparation of oil and cattle food. The oil obtained from them has gradually displaced the imported coconut oil and retarded the importation of other edible oils."

TROPICAL BRAZIL.

The coconut palm attains a great size on the seashores, and by its presence indicates the suitability of the climate and soil for this culture. Although there are a very large number of trees along the coast, they are as yet little cultivated, and not until the serious attention of organised industry, backed up by adequate capital, is attracted to it, can we look for an output such as might fairly be expected from the wide areas available for the industry.

EUCADOR.

Coconuts are grown in the lowlands, where the rainfall, climate and soil are all suitable for the culture, which is carried on there, but by not any means to an extent commensurate with the area available for the growth and the natural advantages offered. At present, not only in Eucador, but in the tropics generally, the application of modern methods and scientific principles to the cultivation of coconuts is hardly appreciated at its real value and importance. Doubtless, as new companies take up the culture and bring to it improved methods, not only of cultivation, but of preparing the products, they will find in Eucador coconut plantations a source of large and permanent profits.

TRINIDAD.

The export of coconuts in 1911 exceeded 20,000,000 nuts, and the demand for them continues to increase, as they find a ready market at remunerative prices. The area planted is as yet comparatively small, chiefly in the eastern coast district, in Mayaro Bay; on the south-western coast (Cedros district); and in the district served by the railway extension to Rio Claro. There are very considerable areas suitable for this culture, which the increasing demand must necessarily before long bring in to cultivation. —FUTURE OF TROPICAL AMERICA.

COCONUT PLANTING IN TRINIDAD.

The following is taken from a detailed estimate of the expense of clearing land and developing, at the rate of 100 acres per year, a Coconut estate of 500 acres has been kindly contributed by MR. W. GREIG of St. Marie Estate, Cedros, to *Bulletin No. 71* of the Agricultural Department of Trinidad and Tobago :—

EXPENDITURE.

1ST YEAR.

Cost of Land. 500 acres @ £2.10 per acre	...	£ 1,375
Clearing 130 acres @ £1.10 per acre	...	195
Roads and Traces ...	...	50
Lining, holing, planting, and seed nuts (100 acres)	...	165
Weeding and cutlassing	...	150
Draining	...	25
Stock (5 Oxen,, 2 Cows, 2 Horses, 1 Cart, Stable, Pen)	...	300
Labourers' barrack (12 rooms)	...	300
Dwelling house	...	400
Ward rates and taxes	...	32
Supplies and contingencies	...	100
Superintendence	...	200
		£3,292

2ND YEAR.

Cultivating 100 acres planted 1st year	...	£ 175
Maintenance of roads, traces, etc.	...	25
Clearing 100 acres new land	...	150
Roads and traces, new	...	50
Lining, holing, and planting 100 acres new land	...	165
Weeding and cutlassing, new land	...	150
Labourers' barrack for Immigrants (6 rooms)	...	175
Immigration charges on 12 Immigrants	...	25
Ward rates and taxes	...	34
Supplies and contingencies	...	100
Superintendence	...	200
		£1,249

NOTES ON ESTIMATES.

Expenditure is based on average Trinidad conditions as regards (1) labour supply, (2) soil conditions and shipping facilities.

(1) Available land suitable for coconuts can only be had in sparsely populated districts where there would be difficulty in getting sufficient seasoned labour to clear more than 100 acres per year. For ordinary cultivation work, Indentured Immigrants are allowed for the second and subsequent years. At the end of the sixth year there will be 60 immigrants on the estate and the estimates allow for this number being maintained.

Under the most favourable soil conditions the expenditure of one unproductive year (£1,540) could be eliminated and the time of coming into

bearing reduced by one year. Under favourable conditions it would be necessary to add one or more years of expenditure and increase the time of coming into bearing.

Sufficient stock and carts have been allowed for to work the estate and deterioration of oxen will be made good by keeping the two cows bought in the first year busy.

Crops have been estimated on a conservative basis and the value of nuts is estimated at 10/- per 1,000 below present value which is exceptionally high and not likely to last. Only under the most unfavourable conditions would the crops estimated not be realised.

Copra has been estimated at present prices on estates and no reduction has been made as there is every likelihood of this value being maintained.

SUMMARY.

Year	Expenditure	Revenue	Expenditure from the 9th to the 12th year, in excess of Revenue.
1st	£3,292	Nil	...
2nd	1,249	,,	...
3rd	1,475	,,	...
4th	2,096	,,	...
5th	2,003	,,	...
6th	1,745	,,	...
7th	1,540	,,	...
8th	1,540	,,	...
9th	1,566	£197	£1,369
10th	1,605	497	1,108
11th	1,680	1,066	614
12th	2,160	2,048	112
13th	2,504	3,523	...
14th	2,522	4,801	...
15th	2,528	5,986	...
16th	2,555	6,948	...
17th	2,611	7,375	—
	£34,671	£32,441	£3,203

At the end of the eighth year the expenditure amounts to £14,940, from the ninth to the twelfth year there is a further expenditure of capital amounting to £3,203 before the estate becomes self-supporting.

The actual working capital required for an estate of 500 acres is £18,143 or £36 an acre.

COCONUTS IN TOBAGO.

By THOS. THORNTON, A.R.C.S.

The Coconut Industry of the West India Islands, as a commercial enterprise, is a comparatively new one, and is rapidly assuming very important dimensions. For long years back the coconut palms fringing the coast line have been the first plants which probably conveyed to the minds of travellers

the idea of tropical vegetation, and most of the illustrations used by old writers to give an impression of the islands met with in these climes show a line of waving coconut palms along the beach, and here and there a small group on the hill sides and even on the hill tops indicating the positions of the native villages.

But a comparatively few years ago the price of sugar was so high in comparison with coconuts, that no one would have dreamt of putting land which would grow the sugarcane into coconuts, so that to-day, in a place like Tobago, we find the oldest palms growing, not on good land suitable for cane, but on the sandy beaches where canes could not flourish. All around the island, on almost every sandy beach these old coconut walks exist, but nowhere inland except where they mark the situations of villages.

Within but a very short period coconuts have grown from being of little commercial value to one of the most valuable crops of the tropics.

In almost all the islands coconuts are being extensively planted, but nowhere in these islands is the cultivation extending more rapidly than in Tobago. At present the crop is about two million nuts, and only a very small fraction of the plants have come to bearing. It has been estimated that there must be close on six thousand acres already planted, and still the cultivation is extending.

In the hilly districts the cultivation lies along the flat land fringing the coast, and ascending for a short distance up the hill slopes which face the sea, as well as in the broad valley bottoms which open to the sea. In the flat leeward district coconuts are planted right across the island, and the whole area of many of the estates is being planted up in this crop.

METHODS OF PLANTING.

As might be expected, different methods of establishing coconut estates are practised, from the most careless to the most scientific. The method adopted usually being determined by the financial condition of the planters, in some instances by the amount of capital which can be spared from the other cultivations.

FREE GARDENS IN TOBAGO.

One method which is commonly adopted is to give out land from one to two acres to the peasants free of charge, to be used as provision gardens. The peasant clears the land, plants his provisions, and the planter puts in his coconut plants at distances of about twenty-five feet square. At the end of from three to four years when the coconut roots have practically taken possession of the land, the peasant gives it up and takes over a fresh piece of land. If the gardens are well looked after, the coconuts grow exceedingly well, in spite of the fact that one or two crops of provisions are being annually taken out of the land. The kinds of crops usually taken off by the peasants are Indian corn, pigeon peas, sweet potatoes, cassava, plantains, etc. During the time the pigeon peas occupy the land, a two-year crop, the coconuts do exceedingly well. They offer a certain amount of shade to the young plants which appears to be quite beneficial to them in the earlier stages of growth as well as keeping the ground protected, which is very important.

PLANTING IN TRACES.

Another method practised is to cut traces through the bush and plant the coconuts in the traces. For about three years the traces only are brushed, after then all the ground is brushed about twice a year. Here nothing is taken off the land, but growing in a kind of valley with high bush on two sides does not give results so good as the garden system. Instead of the plants growing sturdy as they do in the open, they become tall with too little body.

PLANTING IN OPEN GROUND.

On some estates all of the ground is kept brushed from the beginning going through it about twice a year. Here the plants attain a more sturdy growth.

Certain estates are producing sugar cane on the share system, and planting coconuts through the canes. This is almost the same as the garden system, taking off catch crops. Coconuts are also being planted through cotton. The shade offered by the cotton is very similar to that offered by pigeon peas, but canes appear to keep them too closed in, resulting in loss of body until they are about four years old. Where coconuts are planted through canes, a good space should be kept clear around each plant.

INTENSIVE CULTIVATION.

One system practised in Tobago which is certainly the most scientific, is that where the ground is cleared, stumped, ploughed and drained, the plants are put in and seed of some leguminous plant sown so as to get the ground covered. It is much more expensive than any of the other methods practised, but one can reasonably expect, under these conditions, a more rapid growth will take place, and earlier bearing trees will be produced.

SEED NUTS.

The question as to the best seed nuts has received very important consideration. The planter is anxious to produce crops of nuts which will bring in the biggest return, and the difference in price between selects, nuts which will not pass through a ring with a diameter of $3\frac{3}{4}$ inches, and culls, those which pass through the ring, is so great that no one thinks of planting culls in the nursery.

On many of the estates nuts for planting are selected from their own trees. Healthy trees bearing large crops of select nuts are marked on the trunk with paint, and the nuts obtained from them are sown in the nursery.

A large number of nuts have been imported from Venezuela. They have been particularly sought after because of their large size and thin husk. Unfortunately the importer knows nothing of the parentage, of the number of nuts the parent trees produce, their age or condition of health, nor of the condition of soil and climate where these nuts have been produced compared with those of Tobago.

Some of the Tobago planters have thought of these things and have stopped importing from Venezuela, preferring to obtain their seed nuts from nearer home where the climate and soil conditions are known factors as well as the parentage.

NURSERIES.

Nurseries are usually formed on the sandy beach under the old coconut trees. The sand is very loose, and the old coconuts afford a certain amount of shade. A trench is first dug about one foot deep and the nuts are placed on the bottom, close together, either flat or inclined at an angle of about 45 degrees. Occasionally one will see them placed upright, but the former two methods are more usually adopted. After the nuts have been placed in the first trench a second one is dug behind it, and the material taken out is used to fill up the first one only just burying the nuts. The nuts are placed in the new trench and again another one is dug and the nuts in the second buried just as in the first. The Tobago planter usually transplants the young coconuts by the time they are one foot high, hence they do not require so much space in the nursery. Planting the nursery in this way the nuts grow well, and almost always give satisfaction in Tobago. Usually, about four months are taken before germination commences, and about two months more before the seedlings are ready for transplanting.

TRANSPLANTING.

Amongst the Tobago planters there is a very strong opinion in favour of transplanting the seedlings when they are no more than one foot high. There is not so much check to their growth as when transplanted at a later stage. At this stage many of the roots have not emerged through the husk and of course these are not interfered with during the transplanting, and when transplanted at this early stage there is less risk of the breezes interfering with them, transport is easier, and the buds are not so apt to get damaged.

Holes are usually dug some time before planting, varying in size up to two feet square and two deep. In some instances a basket of pen manure is put into the hole before planting, but this is not a usual custom. It is, however, a practice which can be well recommended.

The planters try to get their transplanting done as near the beginning of the wet season as possible, in order that the plants may be well established before the dry season sets in.

Forking around the young plants is practised to a very limited extent but it is a practice which might be adopted more generally with advantage.

TIME TO BRING TREES TO BEARING.

The number of years taken for coconuts to come into bearing varies considerably. I have seen young trees four and a half years old with young nuts on them ; I have heard of instances still earlier ; but as a general rule the time taken is considerably longer. The character of the soil and the care bestowed upon them makes a very great difference in the development of the young plant. Neglected and on poor soil ten years would not be too long a period to bring them to bearing, but on good soil and given good care six or seven years is quite a reasonable time to expect them to require to produce their first crop of nuts.

COCONUT SOILS AND SITUATIONS.

Coconuts unfortunately have been planted on every conceivable kind of soil, from the shallow hillside soil to the sandy beach and as might be expected with as varying results. On the sandy beach with a great depth of

apparently almost pure coral sand the plants grow exceedingly well, in fact. some of the finest coconuts seen in Tobago are growing in such a medium. In alluvial soils, at the opening of the valleys towards the sea excellent results are obtained. They also grow well in what is here commonly called marl, finely decomposed igneous rock. These three mentioned soils are usually very deep, and gives the roots every opportunity of spreading very widely and deeply. Then again over coral in from one foot to eighteen inches of soil they thrive well.

A shallow soil over clay is not good, although the young plants may grow well, the mature plants have a starved appearance, and the crops are not satisfactory. On Hillsides in shallow soil over rotten rock the early growth is very slow and the mature plant has a very starved appearance and produces very few nuts.

Open situations are best, and sheltered valleys, especially where the rainfall is over seventy inches should be avoided.

At the back of lagoons where at high water there is a wash back over the land, usually up old drains, coconuts will thrive well for a few years, and then very often they die, probably owing to the water-logged and sour condition of the soil. On land where water has a tendency to collect and stand, coconuts do not do well, here again probably owing to the water-logged and sour condition of the soil. It is a general opinion amongst planters that fresh moving water is no detriment to the plant whereas stagnant water is fatal.—BULLETIN. No. 71, AGRICULTURAL DEPT. OF TRINIDAD & TOBAGO.

MANURIAL EXPERIMENTS ON COCONUTS.

By JOSEPH DE VERTEUIL, F.C.S.

These experiments, under the control of the Board of Agriculture, are being made on the *Morvant* estate, Laventille ; *Beaulieu* estate,* Cedros ; and *King's Bay* estate, Tobago.

The manures are supplied free of cost to the proprietors, but the cost of application as well as the cost of cultivation is borne by the estate owners.

The manures are spread broadcast to within three feet of the trunk of each tree, about two feet from the edge of the drains, and the surface soil loosened to a depth of about six inches, with the aid of a fork.

Where pen manure is applied it is forked into the soil and the artificial manures spread over it.

Records of pickings are being kept from July 1, in each year, and the number of "selects" and "culls"† reaped from each plot noted separately.

In calculating the yield and cost of manuring per acre, it has been assumed that there are 75 trees to the acre, as the trees are planted 24 feet apart.

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* Results not published.

† "Selects" or "Standard" nuts are those which when husked do not pass through a ring 3¾ inches in diameter and are otherwise sound. "Culls" are sound nuts measuring between 3 and 3¾ inches in diameter.

MORVANT ESTATE, LAVENTILLE.

The plots are situated partly on a slope and partly in a narrow valley between two hills; the soil may be described as an undulating clay loam.

The trees are about 25 years old and planted 24 feet apart. The manures were applied in July, 1911.

MANURIAL EXPERIMENT, MORVANT ESTATE.

Plot	No. of trees.	Manures applied per tree.	Cost of manuring per acre.	Yield—July 1, 1911, to June 30, 1912. Average No. of nuts picked per tree.	Per cent. Selects.	Per acre. Selects.	Culls.
1	70	4 lb. Lime ... / 4 ,, Kainit ...	9'51	20'3	58'9	899	627
2	70	6 lb. Basic slag ... / 1 ,, Sulphate of potash	11'29	38'9	63'7	1,859	1,057
3	**70**	**Control—No manure**	**5'44***	**40'7**	**58'5**	**1,789**	**1,266**
4	70	4 lb. Basic slag ... / 2 ,, Nitrate of soda	11'64	35'1	65'2	1,717	918
5	70	2 lb. Calcium cyanamide / 2 ,, Sulphate of potash	13'79	43'1	61'1	2,007	1,277
6	**70**	**Control—No manure**	**5'44***	**25'9**	**64'9**	**1,262**	**682**
7	70	2 lb. Bone meal ... / 1 ,, Sulphate of ammonia / 150 ,, Pen manure...	17'00	41'0	60'8	1,873	1,206
8	70	2 lb. Superphosphate of lime / 1 ,, Sulphate of potash / 150 ,, Pen manure ...	17'25	31'1	61'9	1,444	888

KING'S BAY ESTATE, TOBAGO.

The plots are situated about 75 yards from the King's Bay beach, on a flat sandy loam. The trees are planted 24 feet by 24 feet, and they are 20 to 25 years old.

The artificial manures were applied in May, 1911, but no pen manure could be obtained for plots 7 and 8.

* Cost of forking.

66·71 inches of rain were registered during the twelve months from July 1, 1911, to June 30, 1912, on this estate.

MANURIAL EXPERIMENTS, KING'S BAY ESTATE, TOBAGO.

Plot	No. of trees.	Manures applied per tree.	Cost of manuring per acre.	Yield—July 1, 1911, to June 30, 1912.			
				Average No. of nuts picked per tree.	Per cent. Selects.	Per acre	
						Selects.	Culls.
			$ c.				
1	46	4 lb. Lime ... / 2 .. Kainit ...	8·51	74·4	70·1	3,911	1,671
2	68	6 lb. Basic slag ... / 1 .. Sulphate of potash	10·28	56·2	67·2	2,832	1,381
	59	**Control No manure**	**4·51**	**60·3**	**68·0**	**3,076**	**1,444**
4	54	4 lb. Basic slag ... / 2 .. Nitrate of soda	10·64	51·1	69·1	2,650	1,184
5	71	2 lb. Calcium cyanamide / 2 .. Sulphate of potash	12·91	67·6	67·0	3,394	1,674
6	**80**	**Control No manure**	**4·56**	**58·4**	**68·2**	**2,989**	**1,390**
7	65	2 lb. Bone meal ... / 1 .. Sulphate of ammonia	9·66	54·1	68·7	2,791	1,269
8	78	2 lb. Superphosphate of lime / 1 .. Sulphate of potash	9·21	60·4	67·1	3,041	1,492

It will be observed that the yield from each plot has been divided into "Selects" and "Culls." This classification is necessary owing to the large difference in the price paid for these two standard sizes of nuts. It is conceivable that certain manures may not increase the number of nuts to any appreciable extent, yet if it is found that the percentage of "Selects" has been increased, the worth of the manure is established.

* Cost of forking.

The value of the nuts reaped has not been calculated and tabulated owing to the fact that records of the yield have only been kept from the date the manures were applied. As nearly a year elapses from the time of flowering to the dropping of the nuts, the manures would have had very little, if any, effect on the number of nuts collected during this period. This year's yield may therefore be considered as a natural yield for each plot.

The number of "Selects" and "Culls" reaped per acre has been calculated for each plot and the figures will be useful for future comparison.

It should be noticed that the yield from the various plots on each estate varies largely; even in the two control, or no manure plots. The difference at Cedros and Laventille is marked. This, in my opinion, is due to the peculiarities of each individual tree, that is, some trees are *naturally* more prolific than others. Unless the *natural* yield of the group of trees comprising each plot is known previous to the application of manures reliable conclusions and comparisons cannot be obtained. Similar remarks have also been made when reporting on the cacao experiments. The Department of Agriculture and Board of Agriculture have accordingly considered it advisable to start a new series of experiments, the former with cacao, and the latter with both cacao and coconuts.—BULLETIN No. 71, DEPARTMENT OF AGRICULTURE, TRINIDAD AND TOBAGO.

A GOOD WHITEWASH.

We have many inquiries as to how to make a durable whitewash, and several recipes have been published in this Journal. Yet still the demands for information come in. Here is a recipe given by an expert painter of Ontario (U.S.A.), who says it will not rub off, especially when applied to smooth surfaces:—

Whitewash requires some kind of grease in it to make it durable. Any kind of grease, even though it be old and partly spoiled, will be all right, though tallow is best. The grease imparts to the whitewash an oil property the same as in good paint.

To a 40-gallon barrel, say, of whitewash thinned ready to use, have incorporated in it 10 lb. of tallow or any grease; mix in lime in the slacking stage, also 10 lb. of salt. In order to incorporate the grease properly, it is necessary to put it in a vessel on the stove, and boil it into a part of the whitewash so as to emulsify and get it into such condition that it can be properly incorporated with the whitewash mixture. Use your judgment; on smooth wood or hard stone it needs a stronger binder than it would on cement or rough sawed timber, which would do with less. Experience will lead you up to doing or having a good job done this way.—QUEENSLAND AGRIC. JOURN.

CACAO.

THE WORLD'S CACAO PRODUCTION.

Scientific horticulture and careful attention to field methods have seldom shown more striking results than in the case of the Gold Coast cacao industry. In 1910 this country ranked fourth among the world's greatest cacao producers, but it now far excels even Eucador, which was until 1911 the only rival São Thomè had for first honours. Bad practices and fungus diseases are surely telling on the São Thomè crop; although extension of area has been going on, the crop of 1912 was considerably less than that for 1910 (36,665 tons).

With very little noise or advertisement, the great new cacao country of the Guinea coast has leaped to first rank and will probably hold this place for many years to come. In 1910 only some 23,000 tons were produced; the 1911 crop was nearly double this.

Southern Nigeria, a near neighbour of the Gold Coast, is rapidly developing the cacao industry, the crop for 1911 being an increase of nearly 50 per cent. over 1910. Brazil, as was expected when she began her cacao planting some ten years ago, has forged to the front and now ranks as fourth in the 1912 list.

Trinidad, British West Indies, has been suffering for some ten years with a combination of bad cultural practices, absurd over-shading, and a very severe fungus disease. The production for 1910 was over 26,000 tons, but tor 1912 was less than 19,000 tons

According to the Gordian of Hamburg, the total production of the world is at present about 230,000 tons, worth in bulk, about 150 million pesos.—Philippine Agricultural Review.

MANURING CACAO IN TRINIDAD.

BY JOSEPH DE VERTEUIL, F.C.S.,

These experiments, under the control of the Board of Agriculture, are being made on nine* estates situated in different parts of the Island.

The manures are supplied free of cost to the proprietors, but the cost of application as well as that of cultivation is borne by the estate owners. The

* We publish the results of only 3 Estates.

manures are spread broadcast to within three feet of the trunk of each tree, about two feet from the edge of the drains and the soil forked to a depth of about six inches. Where pen manure is applied together with artificial manures, the former is first forked into the soil and the artificial manures spread over the surface.

The control plots are also forked but no manures added.

Records of pickings are being kept from September 1, to August 31, in each year.

Tables I to III give the number of trees in each plot, the kind and quantity of manures applied, the actual cost of manuring on each estate and the yield obtained from September 1, 1911, to August 31, 1912.

If the figures given in these tables, under the head "*Average number of pods picked per tree*," are divided by two, the result obtained will be approximately equivalent to number of bags of 165 lb. dry cacao per 1,000 trees.

The cost of manuring includes the value of the manures *landed in Port-of-Spain*, carriage from the estate's buildings to the plots, spreading and *forking* on each estate respectively. The cost of pen manure has been fixed at $ 1·20 (5/-) a ton and in the case of mulch the cost of cutting and carrying to the plots has been included.

The mulch consists of grass and bush obtained from the nearest uncultivated lands. It is spread evenly over the surface after the soil has been forked. When basic slag, sulphate of potash, and sulphate of ammonia are to be applied to a plot, the sulphates of potash and ammonia are applied two months after the slag. In the case of lime and superphosphate of lime, the latter is applied two months after the lime.

In calculating the yield and cost of manuring per acre, it has been reckoned that there are 300 trees to the acre, where the trees are planted 12 feet apart. At Sta. Isabella and Esperanza Estates the trees are planted 13 feet by 13 feet and 12 feet by 14 feet respectively and it has been assumed that there are 258 trees to the acre.

The price of dry cacao has been fixed at eleven cents per pound and twelve pods have been taken to make a pound of dry cacao.

SANTA MARTA ESTATE—TAMANA.

The plots are situated on hilly land and the soil is a heavy clay. The cacao trees are planted at a distance of 12 feet and are irregularly shaded with the Bucare immortel.

The manures were applied in May 1911, and the rainfall from May 1, 1911, to April 30, 1912, was 87·75 inches.

CACAO.—*Continued.*

TABLE I—MANURIAL EXPERIMENTS—SANTA MARTA ESTATE.

Trees 20 to 25 years old.

Plot.	No. of bearing trees.	Manures applied per tree.	Average No. of pods picked per tree.	Yield—Sept. 1, 1911 to Aug. 31, 1912. Per acre of 300 trees. No. of pods picked.	Lb. dry cacao.	Value of dry cacao at 11 cts. per lb.	Cost of manuring.	Col. A less Col. B.
						(A) $ c.	(B) $ c.	$ c.
1	115	2 lb. Basic slag ½ „ Sulphate of potash	11·33	3,399	283	31 13	10 62	20 51
2	111	2 lb. Basic slag ½ „ Sulphate of potash ½ „ Sulphate of ammonia	8·04	2,412	201	22 11	16 22	5 89
3	103	2 lb. Basic slag 1 „ Nitrate of Soda	11·52	3,456	288	31 68	13 72	17 96
4	**114**	**Control—No Manure** ...	**5·59**	**1,677**	**140**	**15 40**	***1 49**	**13 91**
5	112	2 lb. Bone meal ½ „ Sulphate of potash ¼ „ Sulphate of ammonia	4·32	1,296	108	11 88	17 76	—5 88
6	152	1 lb. Bone meal ¼ „ Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	10·91	3,273	273	30 03	27 64	2 39
7	115	1 lb. Superphosphate of lime ½ „ Sulphate of potash ½ „ Nitrate of soda	6·31	1,893	158	17 38	13 92	3 46
8	**106**	**Control—No Manure** ...	**5.94**	**1,782**	**148**	**16 28**	***1 49**	**14 79**
9	104	3 lb. Lime	6·25	1,875	156	17 16	4 69	12 47
10	81	3 lb. Lime ... 1 „ Superphosphate of lime	5·16	1,548	129	14 19	9 50	4 69
11	101	½ lb. Sulphate of potash ½ „ Sulphate of ammonia	8·07	2,421	202	22 22	10 34	11 88
12	110	¼ lb. Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	8·16	2,448	204	22 44	24 30	1 86

ESPERANZA ESTATE—CALIFORNIA.

The soil is flat and is a heavy clay. The cacao trees are planted 12 feet by 14 feet apart and are regularly shaded with the Bucare immortel.

The manures were applied in June 1911, and 46·41 inches of rain were registered from May 1, 1911, to April 30, 1912.

* Cost of forking.

† Dividing the figures in this column by 2=approximately number of bags (165 lb.) dry cacao per 1,000 trees.

CACAO.—*Continued.*

TABLE II.—MANURIAL EXPERIMENTS—ESPERANZA ESTATE.

Trees 9 to 10 years old.

Plot.	No. of bearing trees.	Manures applied per tree.	YIELD—SEPT. 1, 1911 TO AUG. 31, 1912. Average No. of pods picked per tree	Per acre of 300 trees. No. of pods picked.	Lb. dry cacao.	Value of dry cacao at 11 cts. per lb.	Cost of Manuring.	Col. A less Col. B.
			†			(A) $ c.	(B) $ c.	$ c.
1	136	2 lb. Basic Slag ... ½ „ Sulphate of potash	16·18	4,174	348	38 28	9 66	28 62
2	136	2 lb. Basic Slag ... ½ „ Sulphate of potash ½ „ Sulphate of Ammonia	15·55	4,012	334	36 74	13 78	22 96
3	137	2 lb. Basic Slag ... 1 „ Nitrate of Soda	15·49	3,996	333	36 63	12 15	24 48
4	**137**	**Control—No manure** ...	**15·24**	**3,932**	**328**	**36 08**	***1 55**	**34 53**
5	142	2 lb. Bone meal ... ½ „ Sulphate of potash ¼ „ Sulphate of ammonia	14·84	3,829	319	35 09	16 02	19 07
6	132	1 lb. Bone meal ... ¼ „ Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	16·65	4,296	358	39 38	23 25	16 13
7	124	1 lb. Superphosphate of lime ½ „ Sulphate of potash ½ „ Nitrate of soda	14·83	3,826	319	35 09	12 86	22 23
8	**120**	**Control—No manure** ...	**14·22**	**3,669**	**306**	**33 66**	***1 55**	**32 11**
9	130	3 lb. Lime ...	12·66	3,266	272	29 92	4 47	25 45
10	122	3 lb. Lime ... 1 „ Superphosphate of lime	11·44	2,951	246	27 06	8 67	18 39
11	132	½ lb. Sulphate of potash ½ „ Sulphate of ammonia	12·03	3,104	259	28 49	9 69	18 80
12	119	¼ lb. Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	9·91	2,557	213	23 43	19 62	3 81
13	**132**	**Control—No manure** ...	**11·23**	**2,897**	**241**	**26 51**	***1 55**	**24 96**

MONTROSE ESTATE CHAGUANAS.

The plots are situated on a flat, clay loam. The cacao trees are planted at a distance of 12 feet by 12 feet and are irregularly shaded with the Anauca immortel

The manures were applied at the end of April and beginning of May, 1911, and the rainfall in the district for the 12 months ending April 30, 1912, was 50·14 inches.

* Cost of forking. † *Vide* note Table I.

CACAO.—*Continued.*

TABLE—III. MANURIAL EXPERIMENTS—MONTROSE ESTATE.

Trees 40 to 50 years Old.

Plot.	No. of bearing trees	Manures applied per tree.	Yield—Sept. 1, 1911 to Aug. 31, 1912					
			Average No. of pods picked per tree.	Per acre of 300 trees.				
				No. of pods picked.	Lb. dry cacao.	Value of dry cacao at 11 cts. per lb.	Cost of manuring.	Col. A less Col. B.
						(A) $ c.	(B) $ c.	$ c.
1	112	2 lb. Basic slag ½ „ Sulphate of potash	11·36	3,408	284	31 24	12 74	18 50
2	116	2 lb. Basic slag ½ „ Sulphate of potash ½ „ Sulphate of ammonia	11·06	3,318	276	30 36	16 97	13 39
3	108	2 lb. Basic slag 1 „ Nitrate of soda	13·99	4,197	350	38 50	15 70	22 80
4	**123**	**Control—No manure**	**13·18**	**3,954**	**329**	**36 19**	***1 52**	**34 67**
5	111	2 lb. Bone meal ½ „ Sulphate of potash ¼ „ Sulphate of ammonia	12·03	3,609	301	33 11	19 76	13 35
6	118	1 lb. Bone meal ¼ „ Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	15·16	4,648	379	41 69	27 70	13 99
7	100	1 lb. Superphosphate of lime ½ „ Sulphate of potash ½ „ Nitrate of soda	11·87	3,561	297	32 67	15 96	16 71
8	**81**	**Control—No manure**	**12·12**	**3,636**	**303**	**33 33**	***1 52**	**3 81**
9	76	3 lb. Lime	12·39	3,717	310	34 10	6 70	27 40
10	93	3 lb. Lime 1 „ Superphosphate of lime	12·57	3,771	314	34 54	11 28	23 26
11	95	½ lb. Sulphate of potash ½ „ Sulphate of ammonia	10·68	3,204	267	29 37	12 19	17 18
12	82	¼ lb. Sulphate of potash ¼ „ Sulphate of ammonia 75 „ Pen manure	12·47	3,741	312	34 32	22 35	11 97

It is not advisable to draw conclusions from one year's experiments, especially when it is known that the *natural yield* of a group of trees forming different plots is susceptible to such great variations, as has lately been ascertained over a series of ten plots on the River Estate. The *natural yield* for these ten plots for the first year has been found to vary from 11·26 pods to 40·23 pods per bearing tree. Extensive experiments have been started for

* Cost of forking.

† *Vide* note Table I.

ascertaining the *natural yield* of plots on eight cacao estates situated in different parts of the island from which it is expected most useful and instructive information will be obtained. Moreover, the year under review has been so abnormally dry, it is probable, that in several cases the manures have had little or no effect on the crop.

A survey of the figures given in the foregoing tables shows that the yield on some of the estates is very low, this is due partly to unfavourable weather conditions and partly to the fact that, in a few cases, poor yielding fields were selected for the experiments.

Although it is generally admitted that it takes 12 pods to make a pound of dry cacao, it was thought advisable to verify the accuracy of this figure on a large scale. Accordingly the cacao picked from all the plots is sweated and dried separately. The results obtained from each estate is recorded in Table IV.

TABLE IV.

Name of Estate.	Total number of Pods picked.	Lb. dry Cacao.	Number of pods per lb. dry Cacao.
Santa Marta ...	10,312	834	12·36
Esperanza ...	23,668	1,812	13·06
Montrose ...	16,045	1,174	13·67

It will be noticed that it takes rather more than twelve pods to a pound of dry cacao. This is due principally to the effect of the severe drought, as in no instance did it take more than 12½ pods to the pound of dry cacao before the dry season set in. The estates which have taken a larger number of pods to produce a pound of dry cacao, were those which gave the largest proportion of their crop towards the end of the drought i.e., in April, May and June. During this period it sometimes required from 15 to 30 pods to give a pound of dry cacao. These records will be kept again during the coming year when it is hoped that more normal conditions will prevail.—BULLETIN No. 71. AGRICULTURAL DEPARTMENT OF TRINIDAD AND TOBAGO.

EMPLOYER AND LABOURER.

The following dictum of TOLSTOY'S, quoted by the *Daily Mail*, applies to the industry of agriculture as well as to every other great industry of the world :—

"We constantly think that there are circumstances in which a human being can be treated without affection, and *there are no such circumstances,*

PADDY.

CULTIVATION IN CEYLON DURING THE XIXTH CENTURY.

By E. ELLIOTT.

(*Continued from p. 290*).

Much has been said of the terms on which seed paddy is advanced, and as this involves a refund with an addition of one half *in kind*, this has been erroneously interpreted as equivalent to a 50 per cent. exaction in cash, from an impecunious cultivator; whereas in fact from a money point of view the advantage is on the borrower's side. For when the seed is required, paddy is scarce and consequently dear, in most districts selling at Rs. 2 a bushel, which is the rate at which the Dumbara Co-operative Credit Company sold, repayable with interest at 12 per cent. But when the time comes for refunding the advance in kind, *viz.*, harvest, paddy is plentiful and cheap, and the money value of the refunded 1½ bushel only 1½ rupees.

The two systems may in ordinary districts be compared, on a pecuniary basis, as follows :—

1 bushel advanced by Co-operative Credit Society	...	Rs.	2·00
Interest at 12 per cent. for 4 months	... ...		0·08
Total cost	... ...	Rs.	2·08
1 bushel borrowed	... ...		
1½ bushel refunded, worth	... ...	Rs.	1·50
Balance in favour of native system	... ...		0·58

Having during my operations on the Walewe Estate had occasionally to procure small supplies of short term seed, I found it more economical to fall in with the native custom than buy outright and so write with personal knowledge on the point.

But not only is seed obtained on this system of refund in kind, but the actual cultivators indent on the same lines for the maintenance of themselves and their families while engaged in the cultivation, repayable at harvest time. The general rate of drawing for this purpose is a bushel per week per cultivator who, on an average, cultivates an ammonam of land (say three acres) and is engaged 4 months (17 weeks). Taking the area cultivated on the island at 600,000 acres, the requirements absorb 3½ million bushels, worth about Rs. 5 millions.

What is required is the introduction in every locality of superior seed from other districts or foreign countries. MR. DRIEBERG has not

neglected this. As I found by experience the importation of foreign seed paddy from Burmah was very expensive, but paid in time, as I was able to secure much of the first crop for re-sowing in the second year, after which the superiority in yield had largely disappeared. Frequent renewals are consequently necessary and in my opinion the proper course is to have in each Province a Government paddy farm, where the imported seed should be tested and re-grown and the quantity increased until sufficiently large to admit of extensive distributions. At such a farm early hybridization could be guarded against and the jat improved by selection, as is now largely done in Europe.

As showing the necessity of such action I may mention that in Batticaloa for instance, when tested at the mill there the locally grown paddy yielded considerably under one half in bulk of rice, whereas a consignment I sent from Walewe yielded slightly over one half. Also in Matara, my paddy realised over 12 cents a bushel over the local grown grain on same account and so does I believe all the Magam Pattu produce.

So there is evidently room for improving the seed in these districts from a source within the island itself, but still better results may be secured by the introduction of a foreign supply in the manner proposed above.

The reduction of railway fare is a small concession I would suggest, especially on the paddy sent by rail on the Jaffna line. At present the charge for paddy and rice is the same, *viz.*, 12½ cents per ton per mile, though the latter is three times in price, and as it takes two bushels of paddy to make one of rice, the transport charge is 62½ per cent. higher though the dead weight is about equal. Paddy should therefore at least be carried at sixth class rates (8 cents per ton per mile).

As much of the grain grown about Anuradhapura will be sent to the Jaffna market, a distance of 130 miles, this concession would make an appreciable difference to consignors.

ROADS.

Roads to give access to the new lands opened, especially in the irrigated localities, are a pressing want. I note there has been a small outlay to meet this in the Batticaloa district but much more is needed.

I would suggest that in these districts where the population is small, the whole of the funds raised under the Thoroughfares Act should be placed at the disposal of the district Committee for additions to the minor roads so that the upkeep of the principal roads be wholly met from the general revenue.

The roads required are not superior metalled roads, such as those carried out by the Public Works Department but of the cheaper type such as the District Road Committees have developed in the past with the limited money at their disposal.

PADDY (RICE) IN INDIA.

The following reference to Paddy Cultivation occurs in an address by MR. D. T. CHADWICK, Director of Agriculture, Madras, on October 2nd :—

The other great crop in this State is paddy, and possibly you have heard how in the East coast many ryots have effected great savings by reducing the seed rate. Instead of using 40 to 60 Madras measures of paddy as seed for an acre, they are using 8 to 10 Madras measures and are getting just as big if not larger crops than before. Here is a distinct saving of 30 to 40 Madras measures of paddy in every acre. This at the high prices now prevailing for paddy is a clear gain of over Rs. 3 an acre. The means by which they have done this is by sowing the seed beds much more thinly than that hitherto, thereby getting strong healthy seedlings and transplanting them singly. The reason for this is that a healthy seedling of paddy is able to tiller. By this is meant that it does not put forth only one shoot, but ten twenty, and thirty. Paddy, if it has room and scope and is in good soil will bunch forth similarly. But the seedlings must be strong and healthy and, therefore, the seedbed should be thinly sown. The field when first transplanted may look very thin, but wait and see it when full grown. It is then as good as any other, and at harvest it often threshes out better. The richer the land the more does the paddy bunch out and the better the crop. If 10 to 20 seedlings are planted out in a bunch, there is not room for them to tiller. Some inevitably never mature. I do not suggest to you to try single seedling immediately, if you are afraid of it. But your seed rate here is about 40-50 Madras measures. Try half an acre of your best land at only 20 Madras measures an acre. Halve it. Save thereby Rs. 2 to Rs. 2½ an acre. But above all sow the seed bed thinly. Then use some of the paddy from that crop for your next seed bed and sow, if you have succeeded, still more thinly.

The other recommendation I would make for paddy is to try fish manure. The fish are in the sea on your coasts. The manure is being made on your shores. Where is it going? Much of it goes to Ceylon, Japan and other Eastern countries. It is used there to improve the fertility ot the land. They know its value and are prepared to pay for it. But every one would prefer to see it used to improve our own land here in India. At Coimbatore when it was tried on paddy land it gave better results for paddy than any artificial manure except black castor cake. Black castor cake is not always cheap. Fish manure on this West Coast ought to be readily obtainable. We used about 550 lb. to the acre. At first this may seem to some a costly outlay. But it pays. And I make no apology for recommending this outlay.

SUGAR CANE.

MANURING CANE IN TRINIDAD.

BY JOSEPH DE VERTEUIL, F.C.S.

These experiments are under the control of the Board of Agriculture and are being made on the Frederick Estate, Caroni; Esperanza Estate, California; Union Hall Estate,* San Fernando and Malgretoute Estate* at Princes Town.

The manures are supplied free of cost to the proprietors at their railway station, but the cost of application as well as the cost of general cultivation are borne by the estate owners.

The kind and quantity of manures applied, the cost of manuring and the results obtained from the first year's crop, as plant canes, have been drawn up in tabular form for the different estates.

The artificial manures were applied around each cane stool—and lightly forked or hoed in. The lime was spread partly between the cane rows and partly around the stools.

The cost of manuring includes the value of the manures landed in Port-of-Spain and the actual cost of applying on each estate respectively.

The value of the canes reaped has been calculated on a basis of $2·40c. (10/-) per ton.

On the Frederick and Esperanza Estates the fields under experiment had received applications of pen manure at the rate of about ten tons and five tons per acre respectively, previous to their selection for these experiments.

The juice from the canes reaped on each plot on the Frederick and Malgretoute Estates, has been analysed by the Chemists on these estates and I am very grateful for the results which will be found at the end of this report. It is hoped that arrangements can be made to have juice analysed on all the estates, on the lines adopted on the Frederick Estate, for subsequent reports.

FREDERICK ESTATE—CARONI.

The soil is a flat clay loam and was planted with D 109 in October, 1910. The manures and lime were applied on June 3, 1911, and to the estate plot 4 on July 19, 1911.

The estate plot 4 was treated with 3 cwt. of the following mixture :—

1 cwt. Sulphate of Ammonia.
½ ,, Nitrate of Soda.
1 ,, Superphosphate of Lime.
½ ,, Sulphate of Potash.

* Results not published.

SUGAR.—*Continued*

No manure was applied to plot 8, which was kept as a control.

All the plots are 46,000 square feet in extent, except plot 9 which occupies an area of 44,500 square feet.

The canes were reaped at the beginning of May, 1912 and were therefore about 18 months old. The rainfall from the date of applying the manures to the date of reaping was 75·21 inches.

MANURIAL EXPERIMENTS, FREDERICK ESTATE, CARONI—PLANT CANES D 109.

PLOT.	MANURES APPLIED PER PLOT.	PER ACRE. Cost of Manuring.	Yield of Canes.	Increase or Decrease.	Value of Increase or Decrease.	Profit or loss on *no manure*.
		$ c.	Tons.	Tons.	$ c.	$ c.
1	2 cwt. Sulphate of ammonia 1 „ Bone meal ½ „ Sulphate of potash	10 49	30·83	+ 15·45	+ 37 08	+ 26 59
2	2 „ Sulphate of ammonia 1 „ „ potash	10 23	30·07	+ 14·69	+ 35 26	+ 25 03
3	3 „ Calcium cyanamide ½ „ Sulphate of potash	10 66	24·33	+ 8·95	+ 21 48	+ 10 82
4	**Estate plot** 3 cwt. "Mixture"	**7 58**	**24.68**	**+ 9·30**	**+ 22 32**	**+ 14 74**
5	4 cwt. Calcium nitrate 1 „ Superphosphate of lime	11 36	19·32	+ 3·94	+ 9 46	- 1 90
6	2 „ Basic slag 2 „ Nitrate of soda	7 48	15·28	- 0·10	- 0 24	- 7 72
7	10 cwt Temper lime... ...	4 50	16·58	+ 1·20	+ 2 88	- 1 62
8	**Control plot no manure**	...	**15·38**	...	...	.
9	*1 ton Temper lime	8 32	15·65	+ 0·27	+ 0 65	- 7 67

The Manager of the Estate writes :—"About one quarter each of plots 5, 6, 7, 8 and 9 is on lower ground and the soil stiffer." Allowing for this, it would still appear from the above results that sulphate of ammonia and sulphate of potash applied together, at the rate of 2 cwt. and ½ cwt. respectively, per acre, have been beneficial. No direct benefit has been derived from the application of lime.

ESPERANZA ESTATE—CALIFORNIA.

The soil is a flat sandy loam and was planted with B 156 in November 1910. The manures and lime were applied on June 7,1911 and the Estate plots 4 and 8 received a dressing of 2 cwt. sulphate of ammonia each, on July 1, 1911.

*Applied after it had been air-slaked.

SUGAR.—*Continued.*

Each plot occupies an area of 38,720 square feet.

The canes were reaped between March 26 and April, i.e., they were about 16 months old when cut. The rainfall from June 1, 1911 to March 31, 1912 was only 45·04 inches and the season generally unfavourable. The canes suffered in consequence at, and from, the time they were planted.

MANURIAL EXPERIMENTS ESPERANZA ESTATE, CALIFORNIA—PLANTS B. 156.

Plot.	Manures Applied per Plot.	Per Acre. Cost of Manuring.	Yield of Canes.	Increase or Decrease.	Value of Increase or Decrease.	Profit or loss on average of Estate Plots.
		$ c.	Tons.	Tons.	$ c.	$ c.
1	2 cwt. Sulphate of ammonia 1 „ Bone meal ½ „ Sulphate of potash	11 88	20·91	+ 5·98	+ 14 35	÷ 10 41
2	2 „ Sulphate of ammonia 1 „ Sulphate of potash	11 50	19·57	+ 4·64	+ 11 14	+ 7 58
3	3 „ Calcium cyanamide ½ „ Sulphate of potash	12 04	16·64	+ 1·71	+ 4 10	+ 1 00
4	**Estate Plot** 2 cwt. Sulphate of ammonia	**7 94**	**18·24**	...	..	.
5	4 „ Calcium nitrate 1 „ Superphosphate of lime	12 91	25·39	+ 10·46	+ 25 10	+ 20 13
6	2 „ Basic slag 2 „ Nitrate of soda	8 30	15·77	+ 0·84	+ 2 02	+ 1 66
7	10 „ Temper lime ...	4 67	9·52	- 5·41	- 12 98	- 9 71
8	**Estate Plot** 2 cwt. Sulphate of ammonia	**7 94**	**11·63**	..	...	..
9	*1 ton Temper lime ...	9 28	6·82	- 8·11	- 19 46	- 20 80
	Average Estate Plots ...	**7 94**	**14·93**		.	.

These results obtained at Esperanza show a profit over the Estate plots (2 cwt. sulphate of ammonia) except in the case of the lime plots. Owing to the dryness of the season, the manures have probably not had full effect, and the most soluble manures, viz., those of plot 5 have had an advantage. Sulphate of potash appears to have been beneficial as will be seen by comparing plots 1 and 2 with the Estate plots.

SUGAR.—*Continued.*

ANALYSIS OF CANE JUICE EXTRACTED BY FIRST MILL.

MANURIAL EXPERIMENT PLOTS—FREDERICK ESTATE, CARONI.—PLANTS D. 109

Date of Grinding.	Plot.	Brix at 63° F.	Sucrose per cent.	Glucose per cent.	Quotient of purity.	lb. Sucrose per gal.
May 3, 1912 ...	1	17·6	14·64	1·90	83·2	1,563
„ 3, „ ...	2	18·57	15·43	1·76	83·1	1,656
„ 4, „ ...	3	18·75	15·82	1·80	84·4	1,698
„ 4, „ ...	4	18·75	15·64	2·00	83·4	1,679
„ 6, „ ...	5	19·12	16·08	1·87	84·1	1,728
„ 6, „ ..	6	19·6	16·71	1·52	85·3	1,803
„ 7, „ ...	7	20·2	17·49	1·67	86·5	1,889
„ 7, „ ...	8	19·8	17·29	1·48	87·3	1,866
„ 7, „ ..	9	20·0	16·98	1·48	84·9	1,831
„ 7, „ ...	*	19·7	16·41	1·85	83·3	1,769

*Juice from canes in the same field, but not part of any of the plots.

BULL. NO. 71 AGRICULTURAL DEPARTMENT OF TRINIDAD & TOBAGO.

CO-OPERATIVE CREDIT IN MAURITIUS.

MR. S. WILBERFORCE who has sent in his report to Government on the prospects of co-operative credit banks among Indian small planters in Mauritius observes that some small planters can also borrow from estates owning factories or from middlemen acting on behalf of estates or independently. Concerning these sources of credit there unfortunately exist no statistics, and I am able to give only the results of my investigations derived from personal inspection of some estates, and from other information. As far however as I could discover the following is roughly the position. Out of the estates owning factories many do not take small planters' canes, or only small quantities, and make no advances. About two thirds of the estates take a considerable quantity of the cane of small Indian holders. Of these estates some make advances to their own métayers and tenants only, some regulate their advances according to the probable prospects of securing sufficient cane for manufacture, and some lend small sums to small planters direct and larger sums to their middlemen. There remain the estates who have a regular clientéle of small planters, and always make advances to them. The estates which only lend directly and regularly to the small planter and make most of their advances direct seem at the most about one-third of the whole, and it must not be supposed that they make advances to any but regular clientéle. Casual suppliers of cane may receive casual advances. The advances made by estates to their regular clientèle are made at rates varying as a rule between 9 and 12 per cent. There are rare cases of lower or higher rates of interest. In all cases the borrower is bound to deliver his cane to the factory which has advanced him money, and receives the rate ruling in the locality for cane, or in some few cases is paid a certain percentage of the sugar.

DRY-FARMING.

(Paper read before the Ceylon Agricultural Society's Meeting on November 3rd, 1913).

By A. W. BEVEN.

I have taken upon myself the task of reading this paper, not because I wish to pose as an authority on the subject, but because I wish the Agricultural Society to take the matter up and demonstrate its utility in the arid districts of the Island, both on high and low lands.

The question will be asked. "What is Dry-Farming?" One of the first authorities on the subject says:—"Dry Farming may be defined as the conservation of soil-moisture during long periods of dry weather by means of tillage. Dry Farming differs from ordinary farming, in that the chief object of the dry-farmer is to prepare his land to receive and retain as much rain as possible."

The modern idea of Dry-Farming originated from methods first practised by JETHRO TULL who is regarded as the Father of Modern Agriculture. The system has long passed the experimental stage and its success has been proved in many parts of the world. I am enthusiast enough to believe that Dry-Farming and explosives in agriculture will revolutionise Agriculture in the Island, and will convert what is now "desert" into cultivated fields and gardens.

By means of Dry-Farming, it has been found possible to raise remunerative crops in regions with a rainfall of only 15 inches. Now, in no part of the Island is the rainfall so low. From a table compiled by the Secretary of our Society and embodied in his very useful Year-Book, I find that the lowest rainfall in the Island is at Hambantota which has 37·28 inches, that is more than double the fall in places where successful crops have been raised by Dry-Farming.

This subject is not new to the Agricultural Society, for during the regime of SIR HENRY BLAKE, the founder of the Society, our Secretary read a paper on Dry-Farming which I regret to say elicited little interest. Our present Director is very much interested in the indigenous population and in Native Agriculture, and I look forward with the utmost confidence to his taking this matter up with his wonted enthusiasm, and changing the "desert" region of this Island, known as the Wanni, into productive farms, vineyards and orchards.

Nothing new will be adopted in the Island at the first suggestion. We must keep pegging away at it till it excites interest and arouses attention. The inhabitants of the Island are apathetic and conservative, even when educated they are lacking in initiative. The important step to be taken in order to arouse interest in anything new is to provide object lessons, and it is for the Society to help the *goiya* to increase his crops and to better his position by improved agricultural methods.

Paddy cultivation is the chief occupation of the goiya but except in favoured localities, it is not a paying occupation. He takes to it because he is proud to be able to say that he eats home-grown rice. Another reason is

that except in the neighbourhood of estates, he has no other source of income and, in many instances, his paddy-fields will not grow other products. At two consecutive meetings of the Experiments sub-Committee at Peradeniya, planters expressed concern at paddy-fields being abandoned in the neighbourhood of their estates. I explained that this was because men, women and children obtained high wages on estates, and villagers come to work only when free from field work. If the Society can, by demonstration, convince villagers that paddy can yield remunerative results, paddy-fields will not be abandoned as now.

Sinhalese villagers, in seasons of deficient rainfall, practise a primitive system of Dry-Farming called "Kekulan." It is very crude and yields poor results. Along the railway line between Polgahawela and Kurunegala, I noticed large tracts of fields cultivated in this way. It consists of dry ploughing in anticipation of the wet weather so as to be able to sow at once with the rains. The defects of the system are that the soil is broken up into clods and is not pulverised as it should be to arrest evaporation of the moisture in the soil. Another defect is that the grass is not killed, and when rain falls, there is a race for occupation of the soil between the grass and the paddy and, as the growth of the former is more rank, the latter is greatly checked in its growth. I saw the fields I mentioned being ploughed and sown at the beginning of September. At the beginning of October cattle were allowed to graze over them as the growth of the paddy plants was unsatisfactory. Towards the end of September, I travelled much in the interior of the extreme southern end of the Chilaw district east of the coach road and, though the fields there had been dry-ploughed, I found the crop doing well, as the soil was more sandy and not so clayey as in the Kurunegala district.

I respectfully suggest that to every Vernacular School in the Island there be attached a paddy field, on which the boys should be taught Dry-Farming. The soil should be stirred over and over again till a soil-mulch of fine tilth be formed and all the weeds be killed out. It occurred to me when penning the notes for this paper that it would not be advisable to broadcast such fields, as the seeds will remain on the surface and not germinate or will be picked up by birds : and so was inclined to recommend a village-made drill to drill-in the seed paddy. Since then, through the courtesy of the Director of Agriculture, I received a copy of WIDSTOE ON DRY-FARMING. In it I find that drilling-in the seed is essential in Dry-Farming. "The broad-casting of seed," says the author, "has no place in any system of scientific Agriculture, least of all in dry-farming. In all good Dry-Farm practice, seed should be placed in rows, preferably by means of one of the drill-seeders found upon the market. The advantages of the drill are self-evident. It permits uniform distribution of the seed, which is indispensable for success on soils that receive a limited rainfall. The deep-seeding often necessary under Dry-Farm conditions makes the drill indispensable." And again : "The drill, the advantages of which were taught two hundred years ago by JETHRO TULL, is one of the most valuable implements of modern agriculture. On Dry-Farms it is indispensable. Drill culture is the only method of sowing that can be permitted if uniform success is desired." I hope some ingenious person with an English model before him will be able to construct a simple and cheap drill which can be made in the village.

There are vast areas of paddy-fields that are not cultivated owing to want of water. If trained Agricultural Instructors be sent to such places, to demonstrate to the villagers by the use of ordinary agricultural implements, the possibilities of Dry-Farming, our Society will be doing a great service. Who knows but in time irrigation in paddy cultivation will be regarded as obsolete and the Government may curtail its votes for Irrigation. It may also help to solve the chena problem, which is now engaging the attention of the Director of Agriculture. It is well known that chena-permits are most largely applied for in dry years when paddy cultivation cannot be carried on. Instead of droughts being dreaded as calamities, the "goiya" will be able to regard them with equanimity.

I will now turn my attention to coconut cultivation, which from my point is of secondary importance to paddy cultivation as the former is chiefly in the hands of the rich and intelligent members of the community who are well able to look after themselves. As is well-known, there are certain areas within the dry-zone on which coconuts suffer much from deficient rainfall. The Experiment Station at Mahailuppalama has demonstrated that with Dry-Farming, it is possible to make coconuts bear in 5-6 years. Unfortunately, the place is not easy of access and very few people have been able to see the results. What has been done at Mahailuppalama can be done elsewhere on coconut estates situated under similar climatic conditions. The old belief was that for the successful cultivation of coconuts a minimum rainfall of 50 inches per annum was essential. With Dry Farming and the possibility of storing much of the rainfall in the soil, a rainfall of 30-40 inches will possibly suffice.

In arid regions, the soil is light and free. The general belief is that such soils are poorer than soils with more body. Chemical analyses may confirm this belief, but the root-system of trees growing in free soils is more extensive than in the case of stiffer soils. Most, if not all, coconut planters are aware that the roots of coconut trees growing on sandy soils go down to a great depth till they reach the region of permanent moisture. They will also have observed that coconut trees growing on sandy soils stand drought better than those growing on hard soils. This is because their roots reach the water plane. Where moisture penetrates, air follows. The oxygen of air helps to render soluble the vast stores of insoluble plant-food in the soil. Roots that travel deep into the soil find both water and food to nourish them.

I noticed recently that coconut trees growing on the North-Western coast till Chilaw is reached showed no signs of the drought then prevailing. I attribute this to the roots having gone deeper and deeper in search of moisture during the dry years that preceded 1912. They must be now drawing water from greater depth than before.

A word now about the "WANNI," THE "DESERT" OF CEYLON. It has been the aim of several Government Agents of the Northern Province to induce the congested population of Jaffna to settle down in the Wanni, but I do not think the Government offered sufficient inducement. As a matter of fact, in recent years, a Syndicate of Jaffna Tamils resident in the Straits made an application to Government for a large tract of land in the Wanni, but the

terms offered were such as no pioneers could accept. It was the same with other applications. If wiser counsels prevail the time when the' Wanni will be occupied by colonies of settlers will not be far distant.

It may be thought that the soil of the Wanni is not fertile. Those who entertain this belief may take heart of grace by what a leading authority says: —"Desert regions are specially adapted to Dry-Farming, because, as a general rule, "desert" lands are deep lands in which the scanty rainfall can be stored for a long period; and though arid lands are usually poor in humus, they are much richer in nitrogen than the soils of humid regions. It has been shown that the nitrogen-giving germs are actually present in large numbers in dry soils. Finally, "desert" lands are usually free from malaria and therefore well suited to colonisation." If special terms be offered to pioneers, they will be able, under the direction of the staff of the Department of Agriculture, to have vineyards and orchards for raising all sorts of fruit trees, chiefly oranges which are now imported in such large numbers from Australia and elsewhere. The Agricultural Society will be able to assist by supplying plants as it is now doing.

I trust that these remarks will arouse interest in a system of cultivation that is bound to have far-reaching effects.

A. W. BEVEN.

Negombo, 20th October, 1913.

RAINFALL AT PERADENIYA.

The rainfall recorded at Peradeniya on Sunday, 5th October and Monday, 6th idem was 6·40 and 7·34 inches respectively. The total quantity, 13·74 inches, fell in 36 consecutive hours. The Mahaweli Ganga ose 28 feet at the bridge.

RAINFALL FOR SEPTEMBER.

Place	1913	1912	Place	1913	1912
	in.	in.		in.	in.
Colombo	2·63	3·87	Kurunegala	2·35	2·37
Kandy	2·36	3·00	Batticaloa	0·20	1·22
Galle	4·82	6·95	Ratnapura	10·35	10·43
Jaffna	4·82	0·06	Badulla	2·40	6·89
Anuradhapura	1·50	0·79	Nuwara Eliya	3·60	4·81

SOILS AND MANURES.

THE SCIENCE OF MANURING.

It is a philosophical common-place that we can only apprehend the external world through the medium of thought; indeed, it may be maintained that we know nothing of the external reality, but merely the workings of our own minds. But without pushing our scepticism to such a point, we must recognise in all our science, i.e., our attempts to reconstruct nature in terms of our mind, a tendency to rest content with explanations which fit in with our habits of thought, and to substitute simple, compact theories for the very complex operations of things in themselves. In other words, it is easier to let our minds work on straightforward "logical" lines than to puzzle out things as they are.

These somewhat trite reflections have been prompted by reading a recently published work on manures by DR. A. B. GRIFFITHS, the author of a long series of communications on questions connected with the nutrition and composition of plants, which have always not received a very cordial recognition. In this book we find developed at considerable length two ideas which we have every reason to consider fallacious, but which for the last half-century have exercised a powerful influence both on agricultural and horticultural practice. These two fallacies are, firstly, that the composition of a particular plant, as ascertained by an analysis of its ash, affords a guide to the manure it should receive; and secondly, that the sulphate or other compound of iron is a desirable ingredient of a fertiliser, because it will give colour to fruit or flowers.

LIEBIG'S PRINCIPLE.

The first opinion is due to LIEBIG, who, putting aside for a moment the question of the supply of nitrogen, laid down the general principle that, after ascertaining what a given crop is accustomed to take away from the soil, it is only necessary to add the same materials beforehand in order to satisfy all the requirements of the plant. Now, such a point of view is at first sight eminently logical; so conformable, indeed, to our ways of thinking that it has taken 20 or 30 years of experiment and hard controversy to demonstrate its insufficiency; in agriculture the idea has practically disappeared, but in horticultural matters it is constantly recurring, owing to the lack of systematic experiments on the nutrition of garden plants. The cardinal defect of LIEBIG's theory is that it takes no account of the soil; it might be true if one started to grow a plant in a pot of pure sand containing no nutriment but that which one added to it, but since the plant is placed in soil containing enough food for at least a hundred crops, though mostly in a more or less dormant condition, manure is only really wanted to make good certain deficiencies which are special to the soil and the crop, and these can only be

ascertained by actual experiment. Different plants have very different powers of getting hold of particular elements of nutrition, and experience shows that the analysis of the ash of the plant does not enable one to predict in which direction the difficulty will lie.

BEHAVIOUR OF FARM CROPS.

We must draw our examples from farm crops, because it is only in regard to them that there is a sufficient weight of experimental evidence, and we will simply instance Wheat and Barley among cereals and Turnips and Mangolds among root crops. In the growth of Wheat it is very rarely that any other manure than a nitrogenous one will be required; nitrogen is what Ville calls the dominant for Wheat, and all field experiments, confirmed by the working experience of two generations of farmers, have demonstrated that under normal conditions, if Wheat be supplied with from one to two hundred-weight of nitrate of soda or sulphate of ammonia, no profitable increase of crop will be obtained by adding phosphates or potash salts. Yet the analysis of the Wheat plant does not show that it takes much nitrogen from the soil; in fact, it takes more potash; only under the usual condition of Wheat-growing does the plant find a special difficulty in making use of the reserves of nitrogen in the soil. As fas as the ash goes, Barley has much the same composition as Wheat, yet Barley requires much less nitrogen than Wheat, and it is very desirable to supply it with some phosphoric acid. The analysis of Swede Turnips would show that the crop takes away from the soil about 100 lb. per acre of nitrogen, 30 lb. of phosphoric acid, and perhaps 120 lb. of potash; yet there cannot be a shadow of doubt but that the proper manuring for a Turnip crop is primarily 60 to 80 lb. of phosphoric acid, then from 10 to 20 lb. but not more, of nitrogen, and only potash in rare cases. Mangolds do not differ greatly in composition from Swedes, yet Mangolds must be manured with nitrogen and potash, phosphoric acid counts for very little, and may often be omitted. Now, these are facts which have been demonstrated to weariness; they may be parallel for Clover, for Potatoes, for Beans, and for all other farm crops; they form the basis of the practice of farmers in every civilised country. And yet Liebig's theory—fallacy, we prefer to call it—still is supposed to hold for garden plants, and Dr. Griffith's book is made up of a series of analyses of the ash of shrubs—analyses which must have cost him endless labour—and recommendations of manure mixtures based on those analyses. We will not labour the point, we will only repeat that in whatever instance the plant itself has been asked by systematic experiment what kind of food it wants, what elements of nutrition it will be grateful for, the answer has borne no relation to the comparative richness or otherwise of its ash in those elements, hence we conclude that an analysis of the plant can afford no guide to its appropriate manuring, and that Griffith's toils are essentially useless for the purpose to which he devotes them.

The writer proceeds to review the evidence bearing on the belief that an exceptional amount of iron in the soil accounted for the brilliancy of

colour in its products and concludes as follows :—

We have dwelt at some length on these two matters, namely, the relation supposed to exist between the ash and the manure appropriate to a particular plant, and the supposed connection of iron with the colour of fruit, for we regard the one as a fallacy, and the other as an unproven hypothesis.—GARDENERS' CHRONICLE. JUNE 13, 1908.

LIFE IN SOIL.

The soil of a farm is not simply an inert mass of material containing certain mineral substances which plants utilise. It is full of living organisms. Besides the numerous insects, worms, etc., it contains myriads of low organisms, not visible to the naked eye but capable of examination by the aid of the microscope. They are known as bacteria or micro-organisms and are so minute that a grain of soil may contain many thousands, increasing and propagating under favourable conditions with incredible rapidity. They exist in soils chiefly in the upper layer. A pinch of soil may contain from several thousands to several millions; loamy soils and soils containing much organic matter contain most, sandy soils contain least. The number decreases gradually from the surface soil downwards till about 3 feet where few or none are present. Each different kind of bacterium performs its own useful purpose in nature, but in the interest of economical cultivation it would appear that the growth of some of them have to be encouraged and the development of others to be checked. The subject however is not at present clearly understood and has to be further investigated by scientific men; for us the practical knowledge is the organic matter, increasing the supply of humus to the soil, has been proved to favour the rapid growth of the kind of bacteria which convert organic ammonia into nitrates, suitable for assimilation by the crops. We have, therefore, to see that we keep up in the soil by application of farm-yard manure, the ploughing under of green crops, and other suitable means a sufficient supply of humus.—MARK LANE EXPRESS.

THE STUDY OF SOILS.

No industry is so vital to the well-being of a nation as agriculture, and nothing is so vital to agriculture as the soil. From its treasury it has been estimated that we drew during the year 1909 more than 8,296,000,000 dollars, and its possibilities are as yet only partially realised. There are still in the country millions of acres which have never felt the plow, while those which are now under cultivation can, by the application of scientific principles, be made to produce many times the present value of their products. How to use and not abuse this great resource is the most important problem which faces the farmer of to-day—one worthy of the best efforts of our most profound and learned scientists; for upon its solution depends the future prosperity of the nation.

This statement is from Bulletin 85 of the Bureau of Soils relating to the soils of the country. While a comparatively small percentage of the soils of the United States have been surveyed and analyesd by the department, more than 800 types of soils have been discovered during the progress of the soil survey. The existence of such a large variety of soil types, each possessed of definite and peculiar characteristics, calls attention to the importance of a careful study of the soils and their relation to agriculture. The Bulletin says:—

"The old idea of soil investigation was to collect samples, examine them in the laboratory, and see what differences could there be determined; the newer idea is to study the characteristics and properties of soils in the field, classify them according to obvious differences, and, with this information in hand, use the laboratory as a means of ascertaining the cause of such variations as cannot be determined in the field. This method of attacking soil problems is the reverse of the usual practice, but because of the great difficulty in duplicating field conditions, it is believed that a field examination should precede laboratory studies. The field observations can thus be used as a check upon laboratory investigation, and as an aid in their interpretation. Field studies furnish a safe and necessary anchor with which to keep the laboratory experiments from being dashed against the rock of pure speculation. The classifying and mapping of the various soil types, together with the study of the conditions and processes under which they have been formed, will furnish essential and invaluable data for the conduct of laboratory investigations. Nature's great laboratory is in the field, and a study of her methods cannot fail to offer many valuable suggestions, and in some cases, is the only means of solving her problems. It is through a combination of field and laboratory investigations that an understanding of this extremely complex body—the soil—can be reached."

The Bulletin treats exhaustively of the soils, their origin, formation and best treatment for agricultural purposes, the great difference between the many types, and adds:—

"Since the soil varies so much as regards both its inorganic and organic constituents, marked differences in character must necessarily result from the almost indefinite number of combinations which may be found. All these differences, however, may be traced to two sets of factors: First, the character of the rock or material from which the soil has been derived and, second, the processes of agencies by means of which this material has been changed from mere rock or rock debris into a medium more suitable for the growth of plants. The former has to do with soil-forming material, the latter with soil-forming agencies. To these two groups of factors are to be attributed the numerous variations in soil conditions found over various parts of the earth.

The importance of distinguishing between these two groups of factors cannot be too strongly emphasised. The tendency in the past has been to stress the former to the neglect of the latter, and this has resulted in classifying together soils of very dissimilar character, simply because they were derived from the same rocks or from rocks which have been formed in the same manner.—SCIENTIFIC AMERICAN.

STERILIZATION OF THE SOIL BY CAUSTIC LIME.

Caustic lime is generally recognised as a material capable of increasing the crop-producing power of the soil. Its action, however, is very complex and but imperfectly understood. In this communication (R.B. HUTCHINSON in the JOURNAL OF AGRICULTURE AND SCIENCE.,) an account is given of experiments designed with a view to supply information calculated to account for such results as are frequently obtained in practice. Equal portions of a poor unmanured soil containing 3 per cent. calcium carbonate were filled into bottles. One portion served as control and the others received O.I,O.5 and 1 per cent. calcium oxide respectively. The water content in each case was brought up to about 18 per cent. and the bottles were kept at room temperature. Quantitative analyses for bacteria, ammonia, and nitrates were made, and small portions of soil were tested for the presence of protozoa. Somewhat similar experiments were carried out with a rich garden soil, an acid soil from the Woburn Experiment Station, and also in pot cultures. The author draws the following conclusions:—

The physical condition of a soil is improved by lime either in the caustic or mild form. By liberating nutrient substances and neutralising acids, lime favours the development of soil organisms. Caustic lime is a valuable antiseptic, and when applied to the soil, even in the presence of large quantities of calcium carbonate, it disturbs, or destroys, the state of equilibrium normally existing between the micro-flora and micro-fauna of the soil.

In addition to killing many bacteria, it destroys the larger protozoa which seem to exert a depressive effect on bacterial growth, and brings about a decomposition of organic nitrogenous constituents of the soil. It is highly probable that these decomposition products serve as nutrients for bacteria and are subsequently resolved into plant food.

The inhibitory action of caustic lime on soil bacteria varies with the soil, is possibly governed by the organic matter present, and seems to persist until all the oxide has been converted into carbonate ; this is followed by a period of active bacterial growth and increased production of plant food. In the pot experiments it was found that while the poor arable soil, containing a sufficiency of calcium carbonate, gave increased yields when treated with O.5 per cent. calcium oxide, the rich garden soil gave decreased yields in the first crop, but largely increased yields in the second crop.—JOURNAL OF THE BOARD OF AGRICULTURE.

SUGAR AS A SURGICAL ANTISEPTIC.

A Correspondent from Jaffna writes as follows :—

"While reading in the October number of the TROPICAL AGRICULTURIST the article headed "Sugar as a Surgical Antiseptic," it occurred to me that you would be interested to know that our people use cane sugar with very good results to dress cut wounds, especially those caused by glass. As soon as a workman gets a cut from his tool he takes some sugar, puts it on the wound in a thick layer and wraps it with clean rag. He takes care that no water comes in contact with the wound. It dries up in a few days.

THE DOMINIONS.

AGRICULTURE IN INDIA.

(*Extract of a Letter from Poona.*)

COLLEGE OF AGRICULTURE,
POONA, 5th OCTOBER, 1913.

Last month we had an Agricultural Conference here and it afforded us an opportunity to study the methods of organising such a Conference and Demonstration. I daresay you must have heard about it. DR. MANN'S paper on the Milk Supply to Indian Cities was the best got-up paper and has created quite a stir here. It only confirmed the necessity there exists to advocate the business side of Agriculture on Co-operative principles. It was brought home to me more forcibly than I had ever felt that the economic situation in India does not admit of advocating a policy that laid stress on founding Agriculture on the scientific side, as had been done in England. India needs first to be taught the rudiments of business agriculture before one can do anything on the lines of Scientific Agriculture. I was delighted when DR. MANN said that what I had seen was what many of the Agricultural Administrators here are beginning to see. MR. KEATINGE, the late Director of Agriculture, had ascribed to lack of capital the slow progress of agricultural improvement here, but as DR. MANN also holds, education and caste systems are two factors that need special stress. At present there is an economic transition, of which I know nothing about, but which DR. MANN tells me is due to the introduction of money. At first all exchange amongst the people was by things in kind—bartering—now money has brought in a factor with an economic situation the people can hardly grasp and thrift is a word that needs introduction into their vocabulary. Market gardening and stock farming which are the especial prerogatives of the small holder are at present in the hands of capitalists whilst cereals and fodder-raising are left to the peasants, all because the peasant does not know how to market his goods and thus falling into the hands of the middleman if ever he is to tap the central markets. Thus most of the profits that should fairly come to the agriculturist goes to the middleman. It was thus I was taught to see the problem of agricultural organization as a whole and it certainly did open to me a world of possibilities with a need for men who must be enthusiasts and plodders, or in other words—apostles of the gospel of co-operation—co-operation not merely to supply the lack of capital, but for marketing all produce and getting the best value for any money invested.

HENRY L. VANBUUREN.

AGRICULTURE IN MAURITIUS.

We are in receipt of a copy of the Preliminary Report of MR. F. A. STOCKDALE, Director of Agriculture, on the Agricultural Practices and Activities of Mauritius. The following are some of MR. STOCKDALE'S observations :—

CANE INDUSTRY.

Molasses are generally applied on estates and the results are said to have been very satisfactory. Careful experiments into the manurial value of molasses and into their effects on the soil and its bacterial flora are required, as investigations, under strict scientific control, into the value of molasses as manures in other countries would appear to indicate that their value is relatively low. I have seen indications in this Colony of apparent good effects of molasses-applications in young canes, but figures of actual crops cut should be obtained by means of careful experiments with a view to elucidating, if possible, the causes of the increases in yields after molasses. The practice of applying molasses to the "fumier," and in the fields sometime before planting is, on theoretical grounds, a sound one but experimental data from different methods of application are to be desired.

FIBRE INDUSTRY.

Some fibre factories have been visited and I have attempted to get into touch with the economics of the industry. This industry I am convinced is worthy of very close attention and it could, without doubt, become a very important industry in the Colony. Fibre grows readily in most parts of the Island and can be raised to advantage on land which cannot be economically cultivated with sugar-cane. The fibre industry can progress side by side with the sugar industry without any interference and for this reason it would appear that it should receive early attention from the Department.

At present fibre is not cultivated although some small areas have been planted during late years. Fibre would pay for cultivation and I suggest that areas be put under fibre at Pamplemousses and at Reduit with a view to obtaining as early as possible data as to methods of cultivation and figures relating to cost of cultivation and of yields obtained.

OTHER INDUSTRIES.

Manioc grows well and, in view of the successful establishment of small starch industries in Dominica and St. Vincent, West Indies, and of the trials in Jamaica, I would propose to investigate at an early date the yields of the varieties under cultivation here and the possibilities of working starch of tapioca. Other varieties could also be introduced from various parts for comparative testing against the local kinds.

Rubber has been tried in various parts. The climatic conditions are not favourable to the growth of Para Rubber and the slow rate of growth of the trees confirm this. Nowhere in the Island have I yet seen Para Rubber where its rate of growth indicates that it might be cultivated as a paying crop. Ceara rubber, however, grows readily in most parts of the Island and trials should be made by the Department with different methods of tapping with a view to obtaining figures as to the yields that may be obtainable here.

Coffee grows well in some districts, particularly the Liberian kind. Other varieties ought to be investigated and the introduction of a quantity of seed of Coffea Robusta, through the courtesy of SIR WILLIAM TAYLOR, should be of interest. The methods of cultivation, pruning, etc., are in need of improvement. With the local demand for coffee and with the high prices prevailing at the present time in the world's markets it is certain that the cultivation of coffee is well worthy of attention.

Cacao does well in one or two localities. It makes rather slow growth but seems to yield well where the soil and climatic conditions are favourable. Improvements in methods of cultivation can be made, and assistance in this direction can be rendered.

Tobacco is being tried on a small scale and I would propose that different kinds of seeds be imported and tried experimentally with a view to obtaining the best seed suited to the conditions of the Colony.

Coconuts have been planted in some localities on the leeward side of the Island. They appear to be growing satisfactorily and it is possible that good could be done by importing selected varieties of nuts for sale and distribution. Trials with green manures in young plantations might also be undertaken.

MANURIAL EXPERIMENTS WITH SUGAR CANE.

Reporting under date of 7th July but in continuation of the Cane Industry of the Colony, MR. STOCKDALE says: "The sugar world is generally satisfied that the crop yield of sugar cane depends upon the available nitrogen. The principal questions that different countries and even different districts in the same country have to solve, are the most economical form of nitrogen, the maximum quantity of nitrogen that can be applied with paying results, alone or with cinereals, and the time that the manurings be applied. Experiments with nitrogenous manures should therefore cover:—

N. 1. Comparisons between different forms of nitrogen, without and with cinereals.

N. 2. Comparisons between increases due to increases in the applications of principal nitrogenous manures, without and with cinereals.

N. 3. Comparisons between applications of nitrogenous manures, without and with cinereals, made at different periods of the plants' growth.

Potash is recognised in many countries as being of minor importance as a manure for sugar cane. On some soils in the West Indies deficient in available potash, considerably increased yields have been obtained from applications of potash. In Hawaii increases are recorded when applied with nitrogen but in British Guiana experiments have shown that in the soils and under the conditions there prevailing good cultivation liberates potash in excess of the requirements of the plant. Experiments with potassic manures should comprise:—

K. 1. Quantities of potassic manures required for plants and ratoons alone, with nitrogen alone, and with nitrogen and phosphates.

K. 2. Comparisons of applications of potassic manures, without and with nitrogen phosphates, at different periods of the plants' growth—especially on repousses.

Phosphates have generally been found to give increased yields with virgins, but very slight increase with repousses. Manuring with phosphates, even with virgins, have in some countries proved to be unprofitable. The value of phosphatic manurings here requires very careful investigation and I would suggest the following experiments:—

P. 1. Comparison between different forms of phosphoric acid, without and with other manures.

P. 2. Comparison between different quantities of phosphatic manures that can be advantageously applied to virgins and to repousses.

Lime gives increases in yields on some soils and its mechanical action on the soil is of importance. To satisfactorily test the value of lime a considerable number of plots must be laid out and these under differing conditions of manurial treatment. Suggestions for these are attached.

The value of molasses as a manure, and its action in conjunction with different manures also demands a considerable number of plots.

MEGASS.

A CELLULOSE EXPERT'S OPINION.

DR. CROSS thought it worth while to quote the opinion of WILLIAM RAITT, Cellulose Expert to the Indian Provinces Exhibition of 1910, on this question. The latter wrote:—"Cane sugar factories are usually situated in localities where all manufactured goods have to be imported at a considerable cost for freight, etc., and probably import duties also. Where such circumstances exist, together with a sufficient local demand for unbleached wrapping and packing papers, or even for the thin unbleached paper so largely used by the natives of India, and elsewhere, for correspondence and accounts, it is quite possible that the paper mill may prove a very profitable auxiliary to the sugar factory, and that the megass may be worth considerably more for this purpose than its present fuel value. A paper mill for this class of paper, to produce 40 or 50 tons per week, would cost roughly £20,000. A conservative estimate of the cost of production under average conditions, exclusive of the fuel value of the megass, but including repairs, depreciation and 5 per cent. interest on cost of plant, amounts to £10 12*s* a ton. Under the conditions above referred to, the product should be worth £15, leaving £4 8*s* as the paper making value of the two tons of megass required to produce it, or say £2 per ton. The cost of steam and coal to replace it in the sugar factory furnaces would be at the outside 30*s*. a ton. In calorific effect a ton of good steam coal is usually assumed to be equal to four tons of megass, so that the value of the latter as fuel cannot exceed 8*s* per ton. Deducting this, there remains an estimated profit of 32*s* per ton of megass converted into paper."

DR. CROSS finally hinted that the new system of shredding cane is said to yield a finely divided megass especially suitable for paper making. The process of utilizing it is, however, still in the experimental stage.—BULLETIN NO. 71, AGRICULTURAL DEPARTMENT, TRINIDAD & TOBAGO.

HORTICULTURE.

THE PACKING AND PRESERVING OF SOFT CUTTINGS.

Mr. GEORGE W. OLIVER, of the Office of Foreign Seed and Plant Introduction, U.S.A. Department of Agriculture, suggests the following method of packing soft cuttings. He says :—It has often been found desirable to bring soft or herbaceous plant cuttings from long distances, but the difficulty heretofore attending their transportation has been that the cuttings do not remain in good condition longer than a day or two. This difficulty has been removed by an exceedingly simple contrivance. Dormant hard-wooded cuttings and scions can be sent long distances by mail, as was demonstrated a few years ago in a collection of scions and bud sticks forwarded to MR. WILLIAM S. LYON, at that time in the service of the Government of the Philippine Islands. Not only did the material reach its destination in good condition, but some of it was repacked according to instructions and returned to Washington, where it was successfully grafted in the greenhouses of the Department of Agriculture. Soft or herbaceous cuttings, on the other hand, such as those of alfalfa, clover, and many other plants, cannot be sent long distances by mail or express, but they will survive a journey of six weeks in perfect condition if kept where they can be given light occasionally and attention is paid to supplying the water lost through evaporation. This treatment in the case of alfalfa and many other plants induces healthy root action during a journey of several weeks' duration.

The apparatus for successfully bringing cuttings of herbaceous plants from distant places is of the simplest nature. The necessary articles are a small quantity of living sphagnum moss, two sheets of strong glass 5 by 7 in. or larger, and some string. The cuttings should be prepared in much the same way as though intended to be placed in a propagating bed. Arrange the first layer of cuttings without too much crowding and with the upper surfaces of the leaves on the first piece of glass and on top of the cuttings, and place about 2 or 3 in. of living sphagnum evenly distributed over the cuttings. Place another layer of cuttings on top of this moss, with the under surfaces of the leaves next to the moss, so that all the available space will be covered ; and on top of this second layer of cuttings place the second piece of glass. Press down firmly, remove the moss which protrudes beyond the edges of the glass, and tie together with stout twine. The package now consists of two pieces of glass, 2 in. of pressed sphagnum moss, and two layers of cuttings, one between each piece of glass and the moss. By keeping the moss moist and giving all the light possible (direct sunlight is best, and it does not raise the temperature of the moss to an appreciable extent beyond that of the surrounding atmosphere), the cuttings are not in the least injured, provided the material is free from fungus troubles. If the journey is long enough, say of four to six weeks' duration, cuttings such as those of clover, alfalfa, doryonium, lotus, and many other plants will have rooted freely while closely pressed against the glass. During the time of rooting no attention is required beyond keeping the moss wet and exposing the cuttings to the light for a few hours each day.

With the moss only slightly dampened, scions and bud sticks of rare plants keep a very long time in good condition under the same treatment.—QUEENSLAND AGRICULTURAL JOURNAL.

AGRICULTURAL EDUCATION

COLLEGE OF TROPICAL AGRICULTURE.

LETTER FROM DEAN COPELAND.

DEAN COPELAND, the head of the only College of Tropical Agriculture at present in existence, has addressed the following letter to MR. LYNE. Coming after that of DR. MANN, the Principal of Poona, it must be regarded as an important contribution to the argument in favour of a College of Tropical Agriculture at Peradeniya.

Letter referred to :—

UNIVERSITY OF THE PHILIPPINES, COLLEGE OF AGRICULTURE,

SEPTEMBER 11, 1913.

DEAR SIR,

I have just read with very great interest your proposed scheme for a College of Tropical Agriculture in Ceylon, and have written an editorial on the subject for the PHILIPPINE AGRICULTURIST AND FORESTER. There should certainly be a college of agriculture in the British tropics, and I feel sure that it could not be established anywhere else with initial advantages equal to those it would have at Peradeniya. I have been reading with great interest the publications in various places on this subject, and note that most of its advocates seem not to be aware that there exists any such college in the tropics. Our four years of experience have been sufficient to settle to our own minds a number of points which it would be unfortunate for others to have to learn over again by experience. On the basis of this experience, I take the liberty of offering a few suggestions.

In the first place, the teaching of agriculture itself, construing this as including horticulture, but not animal husbandry, will prove beyond the power of three men after your course has become well established. If your students come to you already prepared in the elements of general agriculture, one man can handle the work during the first year, if you can find a man who has the necessary knowledge of the various lines of tropical agriculture. I do not believe it is practicably possible to teach tropical crops in groups as is usually done with the crops of temperate countries, that is, as cereals, fruits, trees, etc. The staple tropical crops, such as sugar, tobacco, rice, coconut, coffee, cacao, etc., are in every respect so distinct that they can surely best be handled independently of one another. The same is true of the fibre plants We group these in a course; but such crops as cotton, jute, abaca, and ramie have essentially nothing in common, either in the agricultural or the industrial treatment. They are accordingly taken up and settled each by itself. Now, no man is expert enough along any large number of these lines to handle

them in the way that students of the class you are looking for will need. It is my own experience that the administration of the college and instruction on coconut and abaca are enough to keep a man very fully occupied. We have in PROFESSOR BAKER a man of very exceptional capacity for work, and likewise of unusually ample experience. He oversees the work of the college farm (in general, not in detail), and gives our courses on coffee, cacao, tobacco, and plant breeding, beside having charge of the research work of a dozen advanced students. A third man, trained at the University of Illinois, and with two years' experience in the Philippines, teaches the general principles of Agriculture, and gives courses on rice and maize. We have also a very competent Filipino instructor, a graduate of the Iowa College, with several years' experience here since graduation, who oversees all of the details of farm work, has charge of the records of crops, and is very helpful in practical instruction in farm operations. MR. CUZNER is absent this year studying sugar machinery in Louisiana, and our work on sugar is practically given up during the year. After this year, we will never be able to get along with less than five men in plant industry. Your resident staff employed otherwise than by the college may do this work, with a smaller number of its own faculty, but in the long run the work of the college will hardly be done satisfactorily by less men than we have to have here.

Your combination of chemistry and soil bacteriology is a good one. In many places, bacteriology is treated as a part of botany. In practice, it will almost always be better done in connection with chemistry, if it has to be combined with any other subject.

Mycology is of course a part of botany. However, it is my opinion that in temperate countries, and my conviction that in the tropics, botany as a basis for agriculture must be plant physiology. I know that our students trained in plant physiology understand the principles underlying the treatment of crops better than do the most of the students in any college of agriculture in the United States, where plant physiology is not required as a part of their scientific preparation. The botanist of your college should by all means be a well trained plant physiologist. The chances are very strong that you will be unable to secure a competent plant physiologist who is at the same time able to do the work you need done with the fungus diseases of plants. The man you want for the position is PROFESSOR EWART, if you can get him. He has the best of training and ability in plant physiology, and no adequate opportunity to use it where he now is in Australia. It ought to be possible to have the mycology done by a member of your garden staff. A very short course of lectures and demonstrations would suffice for the general treatment of the subject, and the pests of single crops will best be attended to in connection with the study of the crops themselves.

In our college, irrigation, land surveying, mechanics and machinery are grouped in one department as agricultural engineering. At present, Physics is also being taught by this department. The phases of irrigation work which are not distinctly engineering rather than agriculture will hardly demand the service of a member of the faculty.

Veterinary science is not a part of our curriculum because this University has a separate college devoted to this science. This arrangement was made

for purely local reasons, and you will, of course, want veterinary science to be a department of your college of agriculture. I note with some surprise that you make no provision for animal husbandry, although poultry farming is mentioned as still to be considered. In my experience, animal husbandry is the most difficult single department in a college of tropical agriculture. In the Philippine Islands, there is maintained a staff of more than forty doctors of veterinary medicine. These change from time to time. Many of them have come from the best institutions in the United States. I have yet to find one of these veterinarians who seems to me to be competent to handle the subject of animal husbandry. Some of them are trained so that they could handle the work on feeds, but none of them so that they could properly give instruction on breeds; and the subject of the breeds of farm animals in the tropics is so little understood that a man to handle it as it should be done must have the finest kind of training for the purpose.

Your building designs are very interesting, and I hope that you will be able to secure a material establishment such as is contemplated. Our present buildings have cost a total of about £8,000, and we are very badly cramped for room. If you are able to begin with buildings costing about £40,000, it will be a tremendous initial advantage. We have, I believe, less rain than you do, and it is my experience both here and in Manila, that a building with outside corridors has not sufficient light for laboratory work. The College of Medicine in Manila was built with the guidance of the experience of the Bureau of Science, and has proven admirably adapted to its purpose. It is illustrated in the catalogue of the University of the Philippines in the part devoted to the College of Medicine and Surgery. It has all the windows possible, and these windows are practically flush with the outside of the building.

I note that you have so far published no estimate of the cost of maintaining the college, and shall be very interested in your estimates on this point.

Trusting that you will pardon my liberty in volunteering these notes, I am

Very sincerely yours,

EDWIN BINGHAM COPELAND,

Dean, College of Agriculture.

(Through the Registrar, University of the Philippines, Manila, P. I.)

PREVENTION OF THE GROWTH OF SUCKERS FROM STUMPS.

This is another of those questions which have been frequently answered by us, says the QUEENSLAND AGRICULTURAL JOURNAL. The best way to effect the destruction of suckers or to prevent their growing is, if the trees are to be ringbarked, to ringbark in a different fashion to the usual method of cutting out a ring of bark and sapwood. Cut straight in for the upper part of the ring, but cut down slantwise at the bottom part, leaving the bark standing up like a fringe, removing, of course, the detached ring of bark. Then with an oilcan or teapot, pour behind this fringe a small quantity of 'Peardoom." Or make a mixture of 1 lb. white arsenic, 1¼ lb. soda crystals, ¼ lb. saltpetre, 1 gallon water, diluted to double the quantity, if necessary. This mixture will destroy not only the trees but the roots, and consequently no suckers will appear.

POULTRY.

SOME INTERESTING QUESTIONS ANSWERED.

To a correspondent who has sent a number of queries to the POULTRY MAGAZINE of South Australia, MR. GRAHAM HOPE replies as follows :—

Q.: (1) *How long is it necessary to feed chicks on the dry method system as contained in a former issue?* (2) *At what age are chicks supposed to reach maturity?* (3) *How to feed them when they are matured for (a) egg production, (b) breeding purposes, (c) to bring on an early moult?* (4) *How long is it absolutely necessary to give onions to chicks as a prevention against worms?* (5) *Is it necessary to separate pullets from cockerels if they have free range?* (6) *At what age can chicks do without a foster-mother?*

A.: (1) We feed our chicks on the dry feed method until they are matured. After two weeks old the dry meal consists of a very large proportion of bran, the oatmeal being reduced. (2) The age at which chickens mature varies from less than six months to eight or nine. The heavy breeds take longer than the light ones. Pullets nearing maturity should be fed on a very plain diet, no meat or stimulating food being used, so as not to force egg production at too early an age. (3) (a) We never force the pullets for egg production, but feed on the same simple diet as used at the Australian laying competitions. Again ample green food together with milk I find the secret for great egg production without the ill-effects of forcing the birds by use of meat and stimulants. Don't overfeed, as a fat hen means no eggs. (b) Grain at night buried in deep litter to make them work for their food. Every other morning a mash consisting of 2 parts bran, 1 part chaffed lucerne mixed with boiling water, and then left for half-an- hour to swell out, after which period it is dried out with pollard to a crumbly consistency. A small portion of salt is added to the boiling water. Never feed in a warm state or any condiments added, as this would force egg production, and would mean weak germs. On the other mornings grain is fed in litter. Mid-day ample green food is given. In summer each bird gets a half-teaspoonful of Epsom salts in the mash at intervals. Only give as much food as they will eat up greedily, and keep them busy; a fat, lazy hen is a bad breeder. (c) Knock off all soft food and rather underfeed, giving Epsom salts in the drinking water; as soon a the moult has well started give soft food, with a pinch of sulphur added. Both sunflower seed and linseed meal are valuable additions to the bill of fare during this period. Green food is important. By putting the birds in a warm coop the moult will be hastened. It is generally accepted that it takes a fowl from 90 to 100 days to change its coat of feathers. (4) We give our chicks onions up to two months. We find this vegetable one of the most valuable for poultry, and give it freely to the adult stock. (5) I should advise the separation of the sexes, as otherwise

the pullets are liable to come on to lay at too early an age. (6) It all depends on the style of foster-mother used and weather conditions. During this month our chicks at one month old have had no foster-mother.

Your queries have keenly interested me, and I trust my replies may be of some service.

UTILITY POULTRY CLUB'S TWELVE MONTHS' LAYING COMPETITION.

The report for the tenth period of four weeks states that, in spite of the prevalence of broodiness, the egg yield increased slightly, viz., to 7,884 eggs, as against 7,831 in the previous period. This amounts to an average of 13 eggs per bird for the 28 days, by no means a poor average for the time of year. The White Leghorns considerably improved their position during the period; the highest score for the month was made by a pen of White Leghorns, with a total of 125 eggs, valued at 11*s.* 1¾*d.* The scores of the leading pens to the end of the tenth period were as follows:—

Order.	No. of Pen.	Breed.	Total eggs for 40 weeks.	Total money Value.		
				£	*s.*	*d.*
1	60	White Wyandottes ...	1,062	5	4	7½
2	86	Buff Rocks	947	4	19	1
3	32	White Wyandottes ...	992	4	14	11¾
4	45	,, ,, ...	901	4	7	3¼
5	29	,, ,, ...	950	4	6	1½
6	35	,, ,, ...	896	4	4	11½
7	24	Black Leghorns ...	871	4	4	10½
8	54	White Wyandottes ...	910	4	3	11½

—JOURNAL OF THE BOARD OF AGRICULTURE.

CHICKEN RAISING EXTRAORDINARY.

Chicken rearing for the moment is the supreme effort of all poultry breeders, and the following brief resumé of what is being accomplished oversea should induce others to endeavour to obtain similar results in South Africa. It refers to the remarkable results obtained on a small holding near Crewe by MR. PAYNTER, THE DAILY MAIL poultry expert, who

is now working under the British Board of Agriculture. He finds that chickens which weigh 2 oz. at one week old weigh 64 oz. at sixteen weeks old, when they are sold.

The increase in weight is reckoned at over 14 per cent. per week, which is more rapid than any domestic bird or animal except the duck, which is the quickest of all. A sort of challenge has been issued to farmers to prove that any other animal, pig or sheep or bullock, grows in weight or value with anything like such rapidity. MR. PAYNTER proves that 100 lb. of chicken flesh should become 224 lb. in sixteen weeks, which would be over 700 per cent. in the year, though, of course, it is only in the first half of the year that they grow at this pace; and *all* late summer and autumn hatching is discouraged as unprofitable.

The profits in his opinion ought to correspond with the weight. MR. PAYNTER believes that in six months, under his system of feeding, a capital of £100 ought to yield £100 profit simply from the sale of poultry for food. Before accepting this opinion *in toto* it would be well to await further details, for which we have written, and which we hope to publish in an early issue. —SOUTH AFRICAN POULTRY MAGAZINE.

CEYLON POULTRY CLUB SHOW: SATURDAY, 20th SEPTEMBER, 1913.

(*Contributed*)

COLOMBO, SEPTEMBER 20, 1913.

NOTES ON CEYLON'S 20TH EXHIBITION OF PURE-BRED POULTRY.

Plymouth Rocks & Wyandottes: Imported & C. B. Hens or Pullets.—The winner in this class was a white Wyandotte hen in good feather, of excellent type, with a very graceful carriage. She must have won easily.

The second bird was a fairly good specimen, but compared with the winner was rather wanting in type. Another white Wyandotte, exhibited by the owner of the winner, seemed to be rather young, but was of excellent type, and very graceful carriage.

Buff Orpingtons: Imported Hens & Pullets.—The winner, though perhaps rather light in colour, seemed very sound in tail and flights, and showed breeding, being a typical bird with good shape and feather.

Buff Orpingtons: C. B. Hens or Pullets.—There could not have been much difficulty in the placing of this class. The winner, though young, was a very pretty specimen.

Black Orpingtons: Imported Cocks.—This was a very small class, but contained par excellence the best two birds in the show. The Judges must have had some difficulty in placing these birds. To a spectator, No 19, I believe a cockerel seemed to take the palm for depth, breadth, and sweep. I was informed that he had this year taken premier honors at one of the largest and best known shows in Australia, but the much desired card was awarded to the Cock. No 20. Both these birds were of a grand type, possessing great richness of the much-coveted green sheen, and were shown in almost faultless condition. The cock was eventually awarded the Club Challenge Cup for the best bird in the show.

Black Orpingtons: Imported Hens.—In this small class, undoubtedly the best bird won, though rather wanting in condition, she was massive and of excellent type, and also had the reputation of formerly taking premier honors at the well-known Gloucester Show.

Black Orpingtons C. B. Cocks and Cockerels.—The winner in this class was a typical bird of good shape and carriage, with excellent feather. He eventually was awarded the Miller Challenge Cup for the best C. B. cock or cockerel in the show.

Black Orpingtons C. B. Hens or Pullets.—This was a good class, the birds being typical and well shown. To an on-looker, No 35, a large bird, in splendid feather, very low set, with good bone, and thoroughly typical, looked a winner all over; but she was only placed second, and the first prize was awarded to No 32. which result, I have no doubt, was decided by correct judgment after handling.

White Orps: Imported Hens or Pullets.—This was a poor class, three of the birds being almost wanting in Exhibition merit. The winner, No 44, was typical and fairly large, but evidently did not wash out satisfactorily, and showed light sap.

White Orpingtons: C. B. Hens.—By no means a good class. There was no difficulty in placing the winner, but No 47 showed some breeding, and was awarded a V. H. C. card.

Games: C. B. Cocks.—The winner was a typical, well-bred bird of grand carriage, and good bone. The second bird was also of considerable merit.

Games: C. B. Hens.—This was an excellent class, 1st and 2nd birds being well shown, and possessing considerable merit. The winner, though perhaps rather small, was of good type and excellent feather. She ultimately won the Walker Challenge Cup for best C. B. Hen in the show. The second bird was also quite worthy of a show pen, and showed grand breeding.

Minorcas: Imported Hens and Pullets.—The winner in this class was of fairly good type and very correctly placed.

Leghorns and Minorcas: C. B. Hens and Pullets.—No 74, a brown Leghorn, showed very careful and good breeding. Her pencilling was very good, and especially so for a "Country-bred." Her hackle was broadly striped with black. Unfortunately want of leg color helped to bar her from winning the coveted Walker Challenge Cup.

Bantams: Imported and C. B. Cocks.—This was one of the best classes in the show. The owner of 1st and 2nd birds must be congratulated on their respective merits.

Bantams: Imported and C. B. Hens.—This was also a good class, and the owner has again to be congratulated on her 1st and 2nd birds.

A. O. V: Imported Cocks or Cockerels.—This class was noticeable for two (2) Old English Game Cocks being exhibited of excellent type. These birds, as a matter of course, were placed first and second completely eclipsing the other competitors. There was but little to choose between them, feather, carriage, and coloring decidedly good. The winner was nominated for the Club Challenge Cup.

A. O. V: Imported Hens or Pullets.—The winner, an imported barred Rock hen, was a very good exhibit of excellent type, and good leg colour. To a mere spectator, however, she seemed rather deficient in flight barring.

A. O. V: C. B. Cocks or Cockerels.—This was a very indifferent class. The winner, No 15, was the pick of a scratch lot. His leg color was very good, but he was not of stand-out type, neither did he possess that graceful carriage so essential to a Wyandotte. He also had too much leg, and was not bold enough in front. His owner, however, deserves the sincerest congratulations for having acquired that difficult art of thoroughly washing a white bird. In fact, on looking at the Catalogue, all her birds were noticeable for the skill displayed in their show preparation.

Ducks: Imported and C. B.—A very good and interesting class of several varieties. The judges must have been severely taxed to pick out the winning pair—Buff Orpingtons. The Buffs were very typical; the second pair, however, ran them fairly close.

Country-bred Pairs: Prize Miniature of the Bandaranaike Challenge Cup.—This class consisted of six entries. Considerable difficulty must have been experienced in judging the two standout pens of Black Orpingtons. Opinions differed considerably as to the merits of these pens. No 139 secured the coveted award; the pullet of this pen also won the Low-country Special. She was a good typical bird, very well shown.

Breeding Pens: Imported and C. B.—The C. B. Pen, No 144 in this class, was entered for the President's Cup. Much to my surprise no card of any description was awarded to this pen. On looking closely into the pen slight "scaly leg" seemed to be discernible. Perhaps this was the reason for which they appeared to have been passed over. These birds certainly possessed merit, being of excellent type, shapely and well grown. We next come to the imported Cornish Game Trio: the quality and type of both the hens left but little to be desired. They were shown in grand feather, and their coloring was noticeably excellent. Both these birds were worthy of a better mate, the cock being too small, and decidedly wanting in the hens' good quality.

Selling Classes.—The Judge must have experienced no difficulty in placing this award, the winner being a hen of that truly-grand Exhibition breed White Rocks. She was of good feather and type, a large bird with very good leg colour.

Eggs: White.—The winning dozen were decidedly good and very artistically exhibited.

Eggs: Tinted.—This class must have taken some judging; Geese eggs were awarded the first prize.

SPECIALS.

Ceylon Poultry Club Challenge Cup.—For best bird in the Show. Awarded to MR. PRESTON PLUMRIDGE for his imported Black Orpington Cock.

Low Country Prize.—Awarded to MR. M. J. CARY for his Black Orpington Pullet.

THE BANDARANAIKE CHALLENGE CUP.—For the best Country-bred pair. Awarded to MR. M. J. CARY for his Black Orpingtons.

The Miller Challenge Cup.—For the best C. B. Cock or Cockerel. Awarded ot MR. PRESTON PLUMRIDGE for his Black Orpington Cockerel.

The Walker Challenge Cup.—For the best C. B. hen or pullet in the show. Awarded to MR. W. E. A. JANSZ for his Game hen. Ceylon, and especially so as a tropical climate ought to be proud of her Poultry Exhibits.

The Judges must be congratulated on the placing of their awards. It is impossible to please every one; but, on the whole, the judgment seems to have given general satisfaction. Long may the Ceylon Poultry Club flourish. —SAUNTERER.

DETAILED LIST OF WINNERS.

Plymouth Rocks and Wyandottes.—Classes 37 & 40. Imported and C. B. hens or pullets. Prize: Ceylon Poultry Club Silver Medal; JUDGE: M. J. CARY ESQ., (1.) J. H. JONES, (2.) MISS TILLY.

Buff Orpingtons.—Class 44. Imported hens and pullets. Prize: Ceylon Poultry Club Silver Medal; JUDGE: M. J. CARY ESQ., (1.) PRESTON PLUMRIDGE.

Buff Orpingtons.—Class 47. C. B. hens or pullets. Prize: Ceylon Poultry Club Silver Medal; JUDGE: M J. CARY ESQ. (1.) E. DE LIVERA.

Black Orpingtons.—Class 50. Imported Cocks. Prize: Rs. 10/- JUDGES: ALFRED LEWIS ESQ., & M. J. CARY ESQ. (1.) PRESTON PLUMRIDGE, V. H. C. PRESTON PLUMRIDGE.

Black Orpingtons.—Class 51. Imported Hens. Prize Rs. 10/- JUDGES: M. J. CARY ESQ. & ALFRED LEWIS ESQ., (1.) P. PLUMRIDGE.

Black Orpingtons.—Class 53. C. B. Cocks and Cockerels. Prize: Rs. 10/- JUDGES: M. J. CARY ESQ., and ALFRED LEWIS ESQ., (1.) P. PLUMRIDGE.

Black Orpingtons.—Class 54. C. B. Hens or Pullets. Prizes: 1st Ceylon Poultry Club Silver Medal, 2nd Rs. 5/- JUDGES: M. J. CARY ESQ, and ALFRED LEWIS ESQ., (1.) P. PLUMRIDGE, (2.) P. PLUMRIDGE.

White Orpingtons.—Class 58. Imported Hens or Pullets. Prize: Ceylon Poultry Club Silver Medal; JUDGE: M. J. CARY ESQ., (1.) MRS. ROSS.

White Orpingtons.—Class 61. C. B. Hens. Prize: Rs. 10/- JUDGE: M. J. CARY ESQ., (1.) MRS. F. J. REISS.

Games.—Class 74. C.B. Cocks. Prizes: Ceylon Poultry Club Silver Medal, 2nd Rs. 5/- JUDGES: G. W. STURGESS ESQ. & F. A. G. RODRIGO ESQ., (1.) G. N. G. WALLES, (2.) E. DE LIVERA.

Games.—Class 75. C.B. Hens. Prizes: 1st Silver Cup presented by W. P. D. VANDERSTRAATEN ESQ., 2nd Rs. 5/- JUDGES: G. W. STURGESS ESQ., (1.) W. E. A. JANSZ, (2.) G. N. G. WALLES.

Minorcas.—Class 79. Imported Hens or Pullets. Prize: Rs. 10/- JUDGES: P. PLUMRIDGE ESQ., and E. DE LIVERA ESQ., (1.) MRS. JOLIFFE.

Leghorns & Minorcas.—Classes 82, 89 and 103. C. B. Hens. Prize: Rs 10/- JUDGES: P. PLUMRIDGE ESQ., & E. DE LIVERA ESQ., (1.) MRS. F. J. REISS (Brown Leghorn).

Bantams.—Classes 113 and 116. Imported and C.B. cocks. Prizes: 1st Silver Cup presented by MESSRS. H. W. CAVE & Co., 2nd. Rs. 5/- (1.) MISS REISS. (2.) MISS REISS.

Bantams.—Classes 114 & 119. Imported and C.B. hens. Prizes: 1st-Presented by M. J. CARY ESQ., 2nd Rs. 7/50; 3rd Rs. 5. (1.) MISS REISS, (2.) MISS REISS. (3.) E. DE LIVERA.

A. O. V.—Class 120. Imported Cocks or Cockerels. Prizes: Rs. 10/- 2nd Rs. 5/- JUDGES: MESSRS K. H. and P. PLUMRIDGE. (1.) MRS. F. J. REISS, 'O. E. G. Cock'. (2.) H. JONES. 'O. E. G. Cock'.

A. O. V.—Class 121. Imported Hens or Pullets. Prize: Rs. 10/- JUDGE: ALFRED LEWIS ESQ., (1.) MRS. F. J. REISS (Barred Plymouth Rock.)

A. O. V. C.B. Cocks or Cockerels.—Prizes: 1st., Rs. 10/- 2nd., Rs. 5/- JUDGES: MESSRS. P. and K. H. PLUMRIDGE. (1.) MISS TILLY (White Wyandotte), (2,) CICELY KERSHAW (White Wyandotte).

Ducks.—Classes 139 & 140. Imported and C.B. Prizes: 1st., Rs. 10/- 2nd., Rs. 5/- JUDGE: M. J. CARY ESQ., (1.) MISS INGLEBY'S Buff Orpingtons, (2.) E. DE LIVERA'S Blue Orpingtons.

The winners also won the Buff Orpington Duck Club's (of Great Britain) Silver Medal.

Eggs—Class 147. White. Prize: Rs. 10/- (1.) MRS. MEADEN.

Tinted Eggs.—Class 148. 1st Prize Rs. 10/- 2nd Rs. 5/- (1.) MRS. ROSS.

C. B. Pairs.—Prize: Miniature of the Bandaranaike Cup. JUDGES: Show Judges. (1.) M. J. CARY (Black Orpington) (2.) P. PLUMRIDGE.

Setting Classes.—(1.) HEW KENNEDY.

Special Prizes.—Best Bird in Show: MR. P. PLUMRIDGE (Black Orpington) Cock.

Best Low Country Bird: MR. M. J. CARY (Black Orpington) Pullet.

Bandaranaike Cup: MR. M. J. CARY (Black Orpingtons.)

Miller's Cup: MR. P. PLUMRIDGE (Black Orpington Cockerel)

Walker's Cup: MR. J. JANSZ, Game Hen.

RUMINATIONS ON THE SHOW BY AN OLD EXHIBITOR.

(Contributed)

Those who remember the occasional exhibition of a pen or two of poultry in coops in Colombo at a Flower or Agricultural Show before the Ceylon Poultry Club came into existence cannot but be struck with the great strides poultry has made and continues to make from the fancier's point of view since annual Shows were first started in Colombo in 1901. Now that the Agricultural Society are going to take up utility poultry we may expect to see this side of the poultry industry make equally great strides during the next few years.

The first pen of fowls I remember seeing exhibited in Ceylon must have been in 1897 when the HON. MR. W. H. JACKSON, who has just retired, won the one and only prize offered for poultry with a pen of golden Wyandottes,

a very handsome variety of the Wyandotte tribe which was very popular at that time. I bought a setting of White Leghorn eggs about that time from MR. A. A. BOWIE, of Great Western, who was one of the pioneers in poultry, as in other branches of stock rearing, and from the advent of a brood of white chicks began my interest in poultry in Ceylon. In these early days the breeding of exhibition poultry was not thought of and the few birds imported were probably from the yards of personal friends of the importers who bred poultry as a hobby.

The inauguration of the Ceylon Poultry Club in August 1902 soon changed this condition of things and orders for fowls were sent to English Poultry farms and exporters. At first importers were inclined to limit their price to dealers to sufficiently secure average specimens. The first pens of fowls imported by a friend and myself in 1902 cost under Rs. 60/- per pen landed consisting of one cockerel and three pullets. Gradually fanciers realised that it was impossible to procure really good birds except at high prices, and large sums of money have in recent years been paid to dealers to secure typical exhibition specimens and often prize winners. It would be interesting to know the value of the poultry imported into Ceylon by members of the Poultry Club,—it must run into well over a thousand pounds sterling. The writer has himself sent over £100 to England on this account for poultry for himself and friends, not to mention two pens of Leghorns from Australia.

A high tide was probably reached in the general excellence of the birds exhibited at this last Show. Not that it constitutes a record in the number of stand-out birds exhibited, much less in the total number of entries, but the average quality of the birds shown was higher than ever before and on the whole they were more true to type. The exhibits were not of course all in true show form; this is probably impossible to achieve in Ceylon but all showed signs of careful selection and preparation for the show pen. Tail-less and obviously out of condition birds no longer put in an appearance. Even in the selling classes were to be seen none of the nondescript birds which in previous years have defied the experience and powers of the judges to guess some of the breeds which had gone to produce them; fortunately however it has not been the duty of a judge to endorse or traverse the claims of owners to include these birds as specimens of well-known varieties except occasionally in justification of the awarding of prizes.

One of the noticeable features of the Show was the number of pens of Bantams exhibited. The shrill and insistent crow of these miniature cocks was a call to visitors to come and see them and they attracted quite a lot of attention. Ducks too made a good class, Buff Orpingtons being shown I think for the first time. The classes for games and Black and Buff Orpingtons were however the only ones that really filled well. There is something grand in the massive and yet shapely Black Orpington which always elicits admiration, more especially from the non-fancier or layman. The two magnificent imported cocks exhibited by MR. PRESTON PLUMRIDGE were undoubtedly the finest pair that have been penned side by side in Colombo.

When one remembers the grand birds that, from time to time, have appeared at our local Shows, birds that would win (and in many cases have won) prizes in the best Shows in England and Australia, one is surprised that their progeny are not prominently figuring as prize winners. One of the most disappointing features of the poultry fancy in Ceylon is that the grand stock birds imported at great expense from Europe and Australia seem to make so little permanent effect upon the pure-bred varieties kept in Ceylon. Why is this? Undoubtedly heavy mortality is one of the chief reasons: not only do the imported birds die or become debilitated very much sooner in the tropics than would be the case were they left in their native land, but too, the percentage of chicks from such birds reaching ma urity is very much smaller than on poultry farms in England and Australia. Apart however from this there can be little doubt that the ordinary person who buys a setting of eggs from imported birds does not reap the advantage that the addition of such good stock to this yard should bring about. Among the European population, change of house or estate or the holiday trip home upset the poultry yard and the result of some years' breeding is too often lost, the consequence being much the same whether the fowls are sold or left to a friend to look after.

The necessity for the introduction of fresh blood into the poultry yard from time to time is even more essential in Ceylon than in non-tropical countries. Even with the most careful breeding there is marked deterioration in the progeny of country-bred birds certainly from a fancier's point of view if not for utility purposes. Birds reared from imported parents form the large majority, if not the sum, of country-bred birds at our Shows, and among these, i.e., the first generation from imported parents, are the prize winners found; I of course except game fowls which are indigenous to the Island.

That the Poultry Club has done a great deal to improve the common "koli" and poultry generally in the Island is undoubted, but for the reasons before-mentioned it seems clear that if any permanent work is to be done in the *establishment of pure breeds* it is imperative that Government should establish a Poultry Farm and stock it with imported birds of one or two chosen breeds, introducing the fresh blood necessary to prevent deterioration in the stock by regular importations.

The HONY. SECY., MR. ALFRED LEWIS, is to be congratulated upon having so successfully managed the recent Show that a small profit is the result.

Although MR. LEWIS did not see his way to allow himself to be nominated as Secretary for the current year, he has kindly consented to run the Annual Show if held in Colombo and the Club is fortunate in being able to count upon his valuable services in this direction.

Now that his spare time will not be so taken up by the affairs of the Club, MR. LEWIS will, I hope, again appear as a successful exhibitor.

Extract from a letter from a well known dealer in England to a local fancier

We do not ever have any trouble with our birds in connection with bumble foot, but there is unfortunately, in Black Orpingtons, an appearance of diarrhoea, which we attribute largely to the fact that the excreta does not clear the fluff at the Vent as in other birds and in the interests of the fowls—we always clip away all the feathers round the passage and below it in our stock Blacks, as we find this keeps them clean and adds to their fertility to a wonderful degree. Of course, it is not possible to exhibit a bird which has been so clipped until it has moulted, but where the object of the breeder is to secure as large a number of chickens as possible, it is profitable to trim those birds which are reserved for breeding from.

We do not ever put more than four hens with any of our good Black Orpington cocks and in some cases find three sufficient. This secures greater side and stamina in the chickens produced.

The treatment we use for diarrhoea is, for each adult fowl—1 teaspoontul of powdered chalk to half teaspoonful of ground ginger one day—after giving the bird a teaspoonful of Epsom Salts (to remove cause of the looseness) and we believe you will find this answer well.

SUCCESSFUL CITRUS CULTIVATION.

An illustrated account of the suitability of the Don Delta Lands in the neighbourhood of Bowen for the successful cultivation of citrus fruits appears in the QUEENSLAND AGRICULTURAL JOURNAL for September last. The plantation consists of 4,000 orange, Emperor mandarin and lemon trees. From this account it will be seen that the reasons for the success which has attended the work on the Don Delta Groves plantation are fourfold. In the first place, the site for it was carefully selected, and the rich river silt land gives the perfect drainage so essential to the cultivation of citrus fruits; secondly, catch crops have not been grown in the rows between the trees, hence the fertility of the soil has been reserved entirely for the latter; thirdly, the trees have not been allowed to bear, all the fruit being removed almost as soon as found; fourthly, an ideal irrigation plant (standpipe and hose) has provided ample water for each of the 4,000 trees during spells of dry weather.

GENERAL.

HIS EXCELLENCY THE GOVERNOR AND CEYLON AGRICULTURE.

REPLY TO THE PLANTERS' ASSOCIATION ADDRESS.

Mr. Chairman and gentlemen of the Planters' Association. From home I have for many years followed with personal interest the doings of the Planters of Ceylon. I rejoice that their virile efforts have been crowned with a success to which I know of no parallel; and I add the hope that the courage, resolution and judgment which have made the planting industry what it is to-day in Ceylon, may reap even greater triumphs in the years which lie before us. The Planters' Association—whom I desire most heartily to thank for its kindly welcome of my wife and myself—may rest assured that the vast agricultural interests which it represents will not be less dear to me than they have been to my predecessors in office. I shall at all times be ready to confer on important matters affecting agricultural interests; and, conversely, I know that I may count on your assistance and advice in dealing with any allied problems which may present themselves for solution. I take due note of the loyalty and devotion to His Majesty's Throne and Person, to which your closing words testify.

REPLY TO THE ADDRESS OF THE LOW-COUNTRY PRODUCTS ASSOCIATION.

In thanking the Association for their cordial welcome to us on our arrival in Ceylon, I desire to congratulate myself on finding so firmly established an Association of practical men who, as proprietary planters, focus, for the good alike of themselves and of Island Agriculture in general, most valuable agricultural experience, rich in promise for the further development of the Island's natural resources. Early in my term of office I hope to familiarise myself with the agricultural outlook of the permanent population throughout the Island; and in approaching this task I am grateful to this flourishing Association for their liberal assurance of hearty co-operation in furthering the welfare of the millions whose interests must always remain agricultural.

A DISEASE OF PLANTAINS.

(*See Frontispiece.*)

Plantains in Ceylon have hitherto been free from any serious disease, or, at least, no serious diseases have ever been brought to notice. It has however been recently discovered that a large number of plantain stools in the Colombo district are attacked by a disease which ultimately kills them. As far as is known at present, this disease is confined to Colombo and its immediate surroundings, extending from Grand Pass on the north to Timbirigasyaya on the south. It has thus obtained an extensive footing, but there is no reason to suppose that this represents an alarmingly rapid spread of a new introduction. Experiments now in progress would appear to indicate that its spread from one plant to another is rather slow, and if that proves correct there should not be much difficulty in getting rid of it. It is however in the highest degree necessary that all plantain growers should be on the alert to discover this disease as soon as it appears among their plants, and should immediately take steps to eradicate it.

The first sign of the disease is a slight drooping of the leaves. This rather resembles the appearance of a plant suffering from drought, and therefore it is not a decided character by which the disease can be recognised. This drooping is followed by a change in the colour of the leaves. The leaves turn yellowish green and then black, the change beginning at the edge and advancing towards the mid rib. A leaf which is suffering from the effects of the disease shows therefore a zone of blackened tissue round the edge, bordered on the inside by a pale yellow-green band.

Ultimately the leaves die, the centre shoot turns black and rots, and the whole plant becomes more or less rotten down to the base. The "bulb," as a rule, does not show any signs of disease, but the roots are usually found to be damaged and show short lengths of decay a few inches away from the "bulb." So far as investigations have gone, the effects observed on the leaves and stem appear to be due to the injuries on the roots.

The most certain sign of this disease however is to be found in the condition of the suckers which spring from the diseased stool. As a rule these suckers grow to a height of about eighteen inches and then practically stop. Their leaves are small, and instead of being separated from each other by the upward growth of the "stem," they remain crowded together in a rosette. All the leaves, about eight or ten in number, are crowded together in a bunch at the top of a very short stem. These leaves subsequently undergo the same changes of colour as the leaves of the parent plant, and the suckers finally die. If they are removed from the parent plant and replanted elsewhere the result is generally the same; I have been informed that they sometimes recover.

This condition of the suckers is well shown in the accompanying illustration. The main stem of the stool has died and has been cut off, leaving the cluster of suckers. These are short and stumpy, with small leaves clustered together at the top. To the left of the photograph is a fairly well developed plant, which, though not quite healthy, shows almost a normal elongation of the stem and leaves of full size. The contrast between this and the dwarfed suckers gives a good idea of the effect produced by the disease.

If the older plants are bearing fruit when first attacked, the fruits do not ripen but dry up when about half developed.

When a stool is attacked it is useless to think of saving any part of it. The old plant, and *the suckers*, must be destroyed. All the diseased plants must be dug up and treated in some way to prevent the spread of infection, in the case of most plants the simplest way of disposing of diseased material is to burn it. But the plantain "stem" contains so much water that burning seems to be considered impossible. It is however the method advised in the

West Indies, where an outbreak of the "Panama disease" of plantains has been dealt with. There it is stated, "It is not difficult to scorch stumps either with dried grass or trash, or even with a handful of dry trash and some kerosene oil, or petroleum for cheapness, poured over and into the cut-out stumps." The diseased stumps might be cut into strips, preferably lengthwise, and dried, *under cover*, and then burnt.

If the diseased plants are burnt, the place where they have grown should be liberally treated with lime, and forked over.

If the plants cannot be burnt, they should be cut up into small pieces and buried with lime. They should be buried about two feet deep, and about four gallons of lime, as much as a kerosene tin will hold, used for each plant.

It will be useless to plant plantains on the affected soil for about two years. If the diseased plants have been buried it would not be wise to put plantains over them for about twice as long. Where plantains have died, other crops should be grown.

Suckers must not be taken from gardens which have been attacked by the disease. The best advice one can give plantain growers at the present time is,—do not obtain suckers for planting from the Colombo District.

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THE YOKING OF CATTLE.

Recently a communication was received by the Secretary of the Agricultural Society from the Superintendent of Statistics and Intelligence Branch of the Department of Agriculture, Ireland, enquiring among other things about the method of yoking of oxen in Ceylon and whether it is injurious to the glands or heart action.

In the case of a pair of bulls the common practice is to place a fairly thick, smooth wooden yoke over the neck and secure the animals thereto by means of ties (generally of ropes) which pass under the neck and come up through perforations in the yoke.

The yoke which is generally made of light wood is about 6 ft. in length and about 6 inches in diameter at the middle and 5 inches at the extremities.

The principle is the same in the case of a single bull placed between shafts, but the yoke is much lighter and slightly curved to fit the neck. MR. G. W. STURGESS, Government Veterinary Surgeon, is of the opinion that this method of yoking has no ill-effects on the heart or glands, and that the only trouble in connection with the yoke is sore-neck which requires rest and treatment.

It may be added that the animals are driven by means of reins which are attached to a bridle consisting of a rope passing behind the horns and through the nose.

In France the method of attaching oxen to carts by the aid of the horns is a simple enough one, but it would seem to need horns of a particular shape to answer the purpose for which they are employed.

Illustrations of the local and French method of yoking are given for purposes of comparison.

The sore neck referred to by MR. STURGESS is traceable to other causes than the style of yoke, namely, in the first place to the unwieldly carts that are used and in the second to the heavy loads the animals are expected to draw.

Two things are urgently needed to make the burden of our dumb friends easier, a more modern type of cart and the fixing of a maximum load.

It ought to be possible to provide for both these by means of Municipal by-laws, and it is for the local Society for Prevention of Cruelty to Animals to look into the matter.

C. D.

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YOKING OF CATTLE.

LOCAL METHOD

FRENCH METHOD

PLANTING INDUSTRIES OF CEYLON.

From the estate returns compiled for our Annual Handbook and Directory to be supplied from next week, we give to-day (October 4,) the main results:—

399,500 acres under Tea.
240,500 ,, ,, Rubber.
28,000 ,, ,, Cacao.
7,000 ,, ,, Cardamoms.

Against,

IN DECEMBER 1911.

395,000 acres under Tea.
215,000 ,, ,, Rubber.
32,000 ,, ,, Cacao.
7,300 ,, ,, Cardamoms.

Before entering on the consideration of the Statistics before us, an explanation is due as to the later date for the publication of our "HANDBOOK AND DIRECTORY." This delay last year was chiefly due to the alteration of the financial year by the Government, which had thrown out of gear several divisions of the volume referring to administrative and revenue departments, and increased the difficulty of compilation very considerably. This has been followed in the present issue by an unlooked-for increase in printing businesses in Colombo, and consequent competition for the services of a limited supply of trained compositors, eased, it is true—but not sufficiently to make the usual staff available—by the introduction of linotype type-setting machines. It is, however, hoped that next year the Directory may be issued at least two months earlier. The present edition is almost booked up before publication, and any fresh orders now received can only be attended to in rotation.

We turn now to the detailed table which embodies the figures representing the present position of CEYLON'S PLANTING ENTERPRISE in the staples given in our heading. The main results are that now, at mid-September of 1913, there are about 392,500 acres of TEA on the plantations entered in the Directory, and, with the allowance always made for small plots and native gardens, there must be a total in Ceylon of 399,500 acres of TEA or an increase of 4,500 acres since December, 1911. For RUBBER we have a total of 240,500 acres, making due allowance for what is intermixed with tea and cacao, and also allowance for small portions planted, but not reported in the plantation returns. The total shows an increase of 25,500 acres in 20 months. The detailed returns from all the districts indicate no less than 83,345 acres of "tea and rubber" and 19,565 acres of "cacao and rubber," intermixed. In both cases, we have divided equally for the two products; but, in 1910, in the case of "tea and rubber," only one-third was (in the Directory review) credited to rubber and two-thirds to tea. This was afterwards corrected; but it may be a question with some authorities, and in certain districts, whether this proportion can be always maintained; for, although the present high prices encourage full attention to every tea bush, it is also true that rubber, at current prices, and with reasonable cost of production, must be still the more valuable product of the two. In any case, the detailed figures compiled for each district will enable those most interested

to enter into an independent analysis and arrive at their own conclusions, after the volume reaches their hands. Meantime, we consider that 240,500 acres of Rubber may be accepted as a fair approximation for Ceylon at the time. In his Speech to the Legislative Council in 1905, the Governor of the Colony quoted our figures for that year, as showing the wonderful advance of the new industry which had, at that time, expanded to 40,000 acres. But twelve months later, so keen had been the eagerness and activity to plant rubber, that our compilation in 1906, gave no less than 104,000 acres for all the districts ; and now, seven years later, more than double this area has to be faced, and it seems as if we must be getting close to the possible maximum of Rubber Cultivation in Ceylon—at any rate with the Para (Hevea) variety. Yet, who can tell, looking at past experience ? In 1872, for instance, when "coffee" was the staple (and the planter's only product) 206,000 acres were supposed to be a full show for Ceylon plantations, and indeed the very maximum of coffee was reached with 275,000 acres in 1878. Who would have dreamed then, 35 years ago, that the new century, and almost its first decade, would show a grand total of 695,000 cultivated acres (in tea, rubber, cacao, cardamoms, &c.), spread over 1,862 plantations aggregating 1,033,854 acres in their full extent, requiring 2,038 Managers or Superintendents and Assistants and giving employment to about 550,000 Tamil coolies beside 150,000 or more Sinhalese, Moormen, Malays, &c., if all domestics, factorymen, watchers and carters resident in the planting districts are counted. An increase in the number of properties and of opened plantations as well as in total extent is a feature of the progress recorded in 1911-13 ; while there is an increase of 92 in the number of planters, between December, 1911, and September, 1913. This shows how proseperity in tea and rubber—and generally in the island—has led to a large influx of planting assistants and students, during the past twenty months especially.

If we hark back to the comparatively subsidiary products we find that 11,324 acres are planted with Cacao alone ; but there are 19,565 acres covered with rubber and cacao, making 22,107 acres altogether for cacao on plantations which, with the usual allowance for native gardens and wayside plantings will raise the aggregate under the "chocolate" plant in the island to 28,000 acres. Then we have Cardamoms, planted to the extent of 7,000 acres (a decrease of 300 acres, and 367 of Camphor or 128 acres less than were returned at the end of 1911, showing that Camphor clearings have been abandoned or replanted with more favoured products, tea probably. Poor old COFFEE was steadily vanishing from our sight, but the 450 acres of the "Arabian" (or more properly speaking the "Abyssinian") variety in December, 1911, have now become 665 and, curious enough, the "Liberian" has decreased from 179 to 92 acres ; and there are 75 acres of new Coffee Robusta on Houpe Estate, Ratnapura. The CINCHONA returns have now dwindled to only 3 acres in Dikoya. No doubt there must be patches elsewhere ; but it is regarded by planters as not worth while to record an unproductive product, and two years ago "Cinchona bark" was excluded from the Chamber of Commerce export statement. What a contrast to the two seasons (1885-6 and 1886-7 during which Ceylon shipped very close on 30 million lb. of cinchona bark and helped to bring the price of quinine from 16*s.* to 1*s.* 6*d.* an ounce ! [1879-80, Howard's quinine was quoted wholesale 12*s.* per oz., and in 1888-9, it was 1*s.* 6*d.*—after Ceylon in 6 years

had exported no less than 76 million lb. of bark! In 1898 Howard's quinine was priced 1*s.* 2*d.* A special boon was this reduction to India, Southern China, Africa and large parts of America where malaria and mosquitoes abound!] But now, to Cinchona in Ceylon, we have bidden farewell, a long farewell, to all *its* greatness.—CEYLON OBSERVER.

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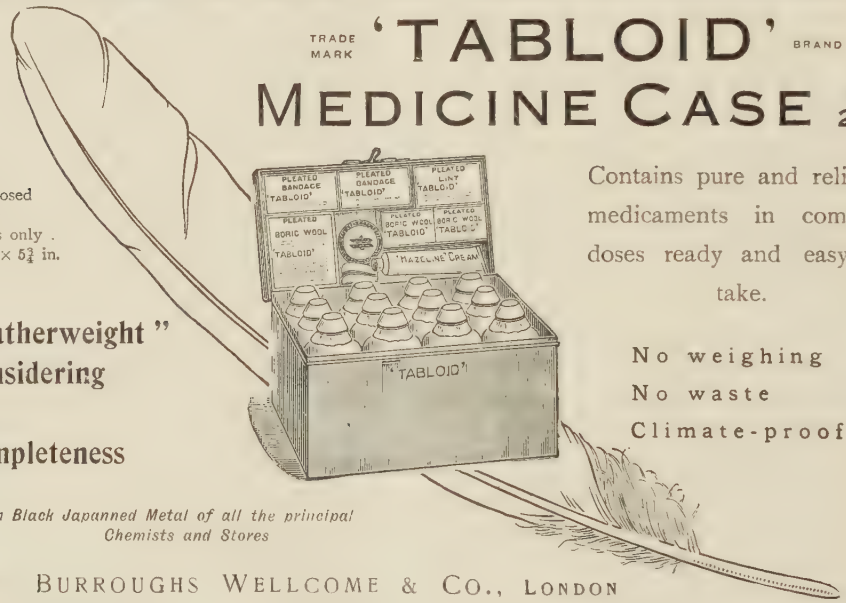

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MOTOR CULTIVATION.

Without any pretence at an exhaustive treatment of the subject, an attempt has been made in this article to review in a general manner the present state of motor cultivation in different parts of the world. One favourable opportunity for doing so is presented through the recent publication of a comprehensive account, by DR. FISCHER,* of the position of this phase of agricultural engineering in Germany.

* *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* (June 1913.)

From the account given by this writer it would appear that after many years' laborious and expensive experiments, the difficulties surrounding the employment of oil engines for automatic ploughs** were first satisfactorily overcome in 1910 by ROBERT STOCK.† The motor-plough invented by this engineer has survived the test of time, and there are now several hundred already in use on small German farms. As regards the work done, and the consumption of fuel by this machine, it may prove of interest to record the following results which were obtained during recent trials conducted by the Colonial Committee, Berlin: 'On a mild sandy loam the motor-plough worked nearly 1·73 acres in one hour to a depth of 6½ inches. The field was 700 yards long, and of a convenient shape. Another day, 1·48 acres per hour were ploughed to a depth of 8¾ inches. Lastly, in consequence of several stoppages due to the field not being sufficiently dry, only 0·99 acre was ploughed per hour to a depth of 7¼ inches. The consumption of benzine was, under the favourable conditions of the first day, only 12·3 lb. per acre, but on an average, in practice, it ranges from 14·3 to 19·6 lb. per acre. The Power developed, as registered by a break dynamometer, was 33·9 h.p.

The technical success of the machine just discussed gave stimulus to other inventors to create improvements, particularly as regards change of gear and reversing. The former operation is important in connexion with the cultivation of undulating land; reversing is still more essential, for if an unreversible machine happens to be brought up against a large stone or any other such obstacle, the mortifying and expensive procedure of invoking the aid of horses to shift it becomes absolutely necessary.

Several new machines of the Stock type eventually appeared on the German market, but very few have survived. In a recent publication ‡ reference is made to a motor-plough of the Stock type, the wheels of which are equipped with shovel points (to prevent slipping) which can be thrown flat against the rim when travelling over hard road. This would appear to be a feature of some practical importance.

Of late, manufacturers seem to have turned their attention rather to the construction of disc motor-ploughs. Pöhl's patent motor-plough, for instance, carries in front of every ploughshare a revolving coulter for diminishing resistance. This feature makes Pöhl's plough resemble somewhat those machines which till the soil not by means of ploughshares, but by revolving hose. In such machines, the driver sits in front of the three-wheeled vehicle which, in the distance, is said not to be at all unlike an ordinary automobile.

As regards the efficiency of disc motor-ploughs, little data is available for pronouncing a final judgment. Experience shows they require more power to work them than ordinary motor-ploughs. On the other hand, their work is more intense, since the discs produce a fine tilth during a single operation. Another advantage which they offer is the fact that the discs work in the same direction as the driving wheels, and although they may not actually propel, they do not act as brakes, as ploughshares do. One disadvantage of the disc is that it is liable to cut up and distribute couch grass, and other perennial weeds.

** *Agricultural News*, Vol. XI, p. 408

† Stock's plough is described on page 255. of the Agricultural News, West Indies

‡ *Experiment Station Record*. Vol. XXVII. No. 7. p. 685.

In considering motor cultivation, the distinction between the self-contained implements just discussed and the American tractor machine must always be borne in mind. These tractors haul other implements besides ploughs. In the case of the ploughs, an advantage is gained under this system in that the shares are independent and yielding; also disc-ploughs can be substituted—a convenient matter when, for instance, ease of penetration and a sort of cutting effect is desired, as in turning under long pen manure or green dressings.

Tractors, at present, are employed in practice more extensively than the self-contained machine. In the Western United States they are fairly commonly used, and are likely to become still more general. P. S. ROSE* has lately collected data from thirty-six agricultural colleges in the United States to show that a somewhat deeper ploughing is needed there to obtain the best crop yields. To double a 4 to 8 inch depth of ploughing, at least 50 per cent. more work animals would be required, and it is believed that this shows the economic necessity of mechanical power for deep cultivation.

Quite recently, in Louisiana, the employment of tractors on sugar estates has been advocated.† Figures have been given to show that, with a six-mule team and a four-mule team, ploughing costs $8 and $4 per acre, respectively; and since tractor engines will do from 10 to 20 acres a day as against one acre by animal power, it is argued that, provided the land surface is suitable and there is sufficient work to be done, implemental tillage ought to be very much more economical.

It is maintained that in Louisiana more might be obtained from the land if a three years' rotation were instituted, namely, two crops of cane and one of corn and peas. Under such a rotation every acre on the estate would have to be ploughed each year. To do this by mule labour would be prohibitive, but practicable with tractor power. The present position of the Louisiana sugar industry, although not referred to in the article in question, would seem to provide a further argument of an external economic nature in favour of the introduction of another staple crop into the cultivations of that State. It may be pointed out in passing, that the employment of tractor power necessitates the filling up of cross ditches—a matter of some moment in regard to Louisiana.

Not only from North, but also from South America have favourable statements emanated concerning tractor ploughs. A recent publication ‡ describes a trial made some few months ago in Peru, with a large 60 h.p. tractor costing with all accessories £2,000. It ploughed, under favourable circumstances, 3·57 acres at a depth of 15 inches in sixty minutes, with a consumption of one tin§ of paraffin. In Hawaii, according to another journal℘ motor traction engines and motor-ploughs have been finding a place on some of the cane plantations. The one which has incurred most favour in Hawaii is the Caterpillar tractor. The opinion of one manager is that a 60 h.p. tractor will plough 8 acres a day to a depth of 6 inches at a cost of $1·50 per acre. The machine will harrow 30 to 40 acres a day.

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* *Experiment Station Record*, Vol. XXVIII, No. 9, p. 892.
† *Louisiana Planter* (June 21, 1913).
‡ *Peru To-day* (May 1913).
§ Presumably 5 gallons.
℘ *Australian Sugar Journal* (May 8 1913).

Perhaps the most thorough trials of tractors and motor-ploughs were those conducted under the auspices of the Royal Agricultural Society of England* in 1910. In these trials, the best all-around efficiency was obtained from a 25 to 30 h.p. compound steam-tractor weighing 5 tons. The oil-engine machines were not so successful. It has to be remembered, however, that considerable improvements have been effected since the time of these experiments.

From the point of view of the investor, the most intimidating feature of motor cultivation is the question of depreciation. For tractors, it is estimated that at least 10 per cent. must be allowed for wear and tear. Motor-ploughs are still too recent to permit of their durability being definitely determined. DR. FISCHER states: "It is usual to calculate for interest, amortizement and repairs, 25 per cent. of the purchase price which amounts for Stock's and similar ploughs to about £830, for the large Ihace ploughs £1,130, and for the smaller ones £735." Such figures have to be reckoned with, even with competent drivers, because the machines have to work under unfavourable conditions, and the quick running engines (720 revolutions per minute, soon wear out. It must be remembered too, that, apart from wear and tear, the constant introduction of new types lowers at least the selling-price of the less up-to-date machines already in use.

As a fitting conclusion to this review, reference may be made briefly to the employment of motor cultivation in the West Indies. For some years, in British Guiana, Trinidad and in Antigua, steam power has been employed for ploughing purposes, but of late, oil locomotives have been introduced into Demerara in connexion with rice cultivation. The possibility of their employment in Antigua has been brought to the notice of planters,† but in that island haulage of implements by stationary engines seems best suited to the soil conditions obtaining in that Presidency.

In any consideration of the employment of motor cultivation, it must always be remembered that although efficient machines exist, both in the form of tractors and self-contained implements, their economic employment depends upon two outstanding factors: labour conditions and soil conditions. That circumstances may actually demand their introduction into some of these islands is made evident by the recent decision of the Government of St. Croix‡ to vote 30,000 francs for the purchase of a motor-plough with accessories, which will be at the service of planters. The Government has furthermore authorized the employment of an engineer, and the expenditure of a sum not exceeding 500 francs monthly, to defray the expenses connected with the working of the machine.

The figures in the following table have been derived from the references quoted. The table is intended to serve purposes of general comparison, and to give an idea as to what the motor-plough and tractor can do; but too much importance must not be attached to the figures individually.

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* *Journal of the Royal Agricultural Society of England*, Vol. 71, p. 179.

† *Agricultural News*, Vol. X, p. 159.

‡ St. Croix *Avis* (June 25, 1913).

Trials	No. of acres Ploughed pr. day of 8 hrs.	Depth of ploughing in inches.	H. P.	Fuel per acre.
Germany* (motor-plough)	14	6·5	33·9	13 lb.
England** (motor-plough)	1·5	6	4	2 gals-
Peru‡ (tractor)	28·5	15	60	1·4 ,,
Hawaii† (tractor)	8	6	60	—
England‡ (tractor)	5	5	18	3·7 ,,
Australia℗ (tractor)	23	3·5	30	1·5 ,,

Price of machines (approx.): Germany (motor-plough), £850- Peru (tractor), £2,000; England (tractor), £275.—AGRICULTURAL NEWS.

THE EDITOR,

THE "TROPICAL AGRICULTURIST," PERADENIYA, CEYLON.

DEAR SIR.

I hope you will not think me too presumptious if I call attention to some points in your July Journal that I take exception to. I should be glad of an equal criticism of matter in the Agricultural Journal of Jamaica of which I am the editor, if I err.

I notice in "Some Poultry Notes" on page 6, a list of breeds of fowls, quoted of course from an American source as follows :—

The American or general purpose breeds are, Plymouth Rocks, Wyandottes, Javas, Dominiques, Rhode Island Reds and Buckeyes.

The English breeds are, Dorkings, Orpingtons and Red Caps.

But why not Old English Games and Cornish India Games and Sussex. If you quote such a little-kept breed as Dominiques among the American breeds, why not include Scots Greys among the English breeds ? You quote also among the American breeds, one that is almost unknown outside of one State—Buckeyes. Why not also add Hornets, Pheasant Fowls and so on, little known English breeds. But what about Golden and Silver Hamburgs, which in spite of the name is also an English breed ?

On page 9 you have an article on "Feeding Chicks" and on page 11 one on "Fowl Ticks" credited to the Journal of the Board of Agriculture, England. Both are my original matter written in the Journal of the Jamaica Agricultural Society.

Yours faithfully,
J. M. BARCLAY, *Secretary*.

Jamaica Agricultural Society,
11, North Parade, Kingston, Jamaica,
September 1st, 1913.

[We regret to have omitted MR. JOHN BARCLAY's name as the author of the articles we took from the Journal of the Board of Agriculture.—EDITOR TROPICAL AGRICULTURIST.]

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Latest Monthly Prices Current.

	QUALITY.	Quotations.
ALOES, Socotrine cwt.	Fair to fine	45/6 a 55/
Zanzibar & Hepatic ,,	Common to good	40/ a 65/
ARROWROOT (Natal) lb.	Fair to fine	6½d a 7d
BEES' WAX cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair	£7 10/ a £7 15/
East Indian, bleached ,,	Fair to good	£8 10/a £8 15/
,, unbleached ,,	Dark to good genuine	£6 5/ a £6 17/6
Madagascar ,,	Dark to good palish	£7 10/ a £7 15/
CAMPHOR, Japan lb.	Refined	1/4½ a 1/6
China cwt.	Fair average quality	155/
CARDAMOMS, Tuticorin	Good to fine bold	5/ 8 a 6
per lb	Middling lean	4/9 a 5/3
Malabar, Tellicherry ,,	Good to fine bold	5/ 8 a 6/
Calicut ,,	Brownish	4/9 a 5/4
Mangalore ,,	Med Brown to good bold	4/10 a 6/4
Ceylon, Mysore ,,	Small fair to fine plump	4/ 5a 5/10
Malabar ,,	Fair to good	3/4 a 3/6
Seeds, E. I & Ceylon ,,	Fair to good	4/4 a 4/6
Ceylon "Long Wild" ,,	Shelly to good	1/2 a 3/2
CASTOR OIL, Calcutta ,,	Good 2nds	4 d
CHILLIES, Zanzibar cwt.	Dull to fine bright	37/6 a 45/
Japan ,,	Fair bright small	28/ a 32/6
CINCHONA BARK.—lb.	Crown, Renewed	3⅜ d a 7 d
Ceylon	Org. Stem	2d a 6d
	Red Org Stem	1¼ d a 4½d
	Renewed	3d a 5½d
	Root	1⅛d a 4d
CINNAMON, Ceylon 1sts.	Good to fine quill	1/3 a 1/7
per lb. 2nds.	,, ,,	1/2 a 1/6
3rds	,, ,,	1/1 a 1/5
4ths.	,, ,,	1/ a 1/3
Chips, &c.	Fair to fine bold	2d a 4d
CLOVES, Penang lb.	Dull to fine bright pkd.	11d a 1/3
Amboyna ...	Dull to fine	10d a 10½d
Zanzibar ...	Fair and fine bright	7d a 8½d
Madagascar ...	Fair	8d
Stems ...	Fair	3d
COFFEE		
Ceylon Plantation cwt.	Medium to bold	Nominal
Native	Good ordinary	Nominal
Liberian ,,	Fair to bold	63/a 80/
COCOA, Ceylon Plant. ,,	Special Marks	86/ a 92/6
	Red to good	81/ a 85/
Native Estate ,,	Ordinary to red	42/ a 78/6
Java and Celebes ,,	Small to good red	30s a 93s
COLOMBO ROOT ,,	Middling to good	14/ a 21/
CROTON SEEDS, sifted ,,	Dull to fair	45/ a 50/
CUBEBS ,, ,,	Ord. stalky to good	137/6 a 170
GINGER, Bengal, rough ,,	Fair	18/
Calicut, Cut A ,,	Medium to fine bold	60/ a 75/
B & C ,,	Small and medium	36/ a 60/
Cochin, Rough ,,	Common to fine bold	27/ a 30/
	Small and D's	27/6
Japan ,,	Unsplit	21/
GUM AMMONIACUM ,,	Ord. Blocky to fair clean	40s a 72s 6d
ANIMI, Zanzibar	Pale and amber, ster. srts	£12 10/ a £14 5/
,,	,, ,, little red	£11 a £12
,,	Bean and Pea size ditto	70/ a £9
,,	Fair to good red sorts	£7 a £10
,,	Med. and bold glassy sorts	£5 a £7 10
Madagascar ,,	Fair to good palish	£4 a £8
	,, ,, red	£4 a £7
ARABIC, E. I. & Aden ,,	Ordinary to good pale	28/ a 32/ nom
Turkey sorts ,,		32/6 a 55/
Ghatti ,,	Sorts to fine pale	18/6 a 32/6 nom
Kurrachee ,,	Reddish to good pale	25 a 30s nom
Madras ,,	Dark to fine pale	22/6 a 29/6 nom
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	£7 a £8
	com. stony to good block	40s a £5 1 2/6
KINO lb.	Fair to fine bright	6d a 1/5
MYRRH, Aden sorts cwt.	Middling to good	55/ a 65/
Somali ,,	,, ,,	45s a 50s
OLIBANUM, drop ,,	Good to fine white	45s a 50s
,,	Middling to fair	35s a 40s
pickings ,,	Low to good pale	15/ a 27/6
siftings ,,	Slightly foul to fine	20s a 22s 6d
INDIA RUBBER lb.	Fine Para bis. & sheets	2/5½
	,, Ceara ,, ,,	2/1½ a 2/2
Ceylon, Straits, ,,	Crepe ordinary to fine	2/2
Malay Straits, etc. ,,	Fine Block	1/5 a 1/7
,,	Scrap fair to fine	1/7 a 1/9
Assam ,,	Plantation	1/10
,,	Fair 11 to ord. red No. 1.	1/3 a 1/6
Rangoon ,,	,, ,, ,,	1/2 a 1/4
,,		

	QUALITY.	QUOTATIONS.
INDIARUBBER lb.		
Borneo ,,	Common to good	9d a 1/2
Java ,,	Good to fine red	1/4 a 1/5
Penang ,,	Low white to prime red	9 d a 1/3
Mozambique ,,	Fair to fine red ball	1/10 a 2/2
,,	Sausage, fair to good	1/9 a 2/1
Nyassaland ,,	Fair to fine ball	1/9 a 2/1
Madagascar ,,	Fr. to fine pinky & white	1/6 a 1/9
,,	Majunga & blk coated	1/ a 1/3
,,	Niggers, low to good	6d a 1/6
New Guinea ,,	Ordinary to fine ball	1/6 a 1/8
INDIGO, E.I. Bengal ,,	Shipping mid to gd. violet	3s a 3s 6d
,,	Consuming mid. to gd.	2s 3d a 2s 10d
,,	Ordinary to middling	2s a 2s 2d
,,	Mid. to good Kurpah	1s 10d a 2s 5d
,,	Low to ordinary	1s 6d a 1s 9d
,,	Mid. to fine Madras	1/9 a 2/1
MACE, Bombay & Penang	Pale reddish to fine	2/4 a 2/6
per lb.	Ordinary to fair	2/ a 2/2
Java	,, ,, good pale	2/ 1a 2/4
Bombay	Wild	1/
NUTMEGS,— lb.		
Singapore & Penang ,,	64's to 57 s	9½d a 10½d
	80's	7½d
	110's	6½d
	160's to 115's	6d
NUTS, ARECA cwt.	Ordinary to fair fresh	17/6 a 20/
NUX VOMICA, Cochin	Ordinary to good	9/6 a 12/
per cwt. Bengal	,, ,,	8/9
Madras	,, ,,	8/ 6 a9/6
OIL OF ANISEED lb.	Fair merchantable	6/7
CASSIA ,,	According to analysis	3/ a 3/5
LEMONGRASS oz.	Good flavour & colour	2¼d
NUTMEG ,,	Dingy to white	1½d a 1⅜d
CINNAMON ,,	Ordinary to fair sweet	3½d a 1s 5d
CITRONELLA lb.	Bright & good flavour	1/9
ORCHELLA WEED—cwt		
Ceylon ,,	Fair	10/ Nom.
Madagascar ,,	Fair	10/ ,,
Zanzibar ,,	Fair	10/ ,,
PEPPER—(Black) lb.		
Alleppy & Tellicherry	Fair	5⅜d a 5½d
Ceylon ,, ,,	Fair to fine bold heavy	5⅞d a 5¾d
Singapore ...	Fair	5⅛d
Acheen & W. C. Penang	Dull to fine	5d a 5½d
(White) Singapore ,,	Fair to fine	8¾d a 9d
Siam ,,	Fair	8⅜d
Penang ,,	Fair	7⅜d
Muntok ,,	Fair	9¼d
RHUBARB, Shenzi ,,	Ordinary to good	3/ a 4/
Canton ,,	Ordinary to good	2/ 6 a 3/6
High Dried ,,	Fair to fine flat	1/ a 1/2
	Dark to fair round	9 d a 11 d
SAGO, PEARL, large--cwt	Fair to fine	18/
medium ...	,, ,,	17/
small ...	,, ,,	13/ a 15/
Flour ...	Good pinky to white	11/ a 12/
SEEDLAC cwt.	Ordinary to gd. soluble	65/ a 85/
SENNA, Tinnevelly lb.	Good to fine bold green	5d a 8½d
	Fair greenish	3¼ d a 4½d
	Common specky & small	1½d a 3d
SHELLS, M. o' PEARL—		
Egyptian cwt.	Small to bold	90/ a £ 9 2/6
Bombay ,,	,, ,,	80/ a £9 7/6
Mergui ,,	Chicken to bold	10 17/6 a 14 2/6
Manilla ,,	Fair to good	£9 a £14 17/6
Banda ,,	Sorts	75/ a 92/6
Green Snail ,,	Small to large	60/ a 100/
Japan Ear ,,	Trimmed selected small to bold	72/6 a £9 5/
TAMARINDS, Calcutta...	Mid to fine bl'k not stony	13/
per cwt. Madras	Inferior to good	6/ a 10/
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Small to bold	11/ a 31/
	Pickings	12/ a 22/
TURMERIC, Bengal cwt.	Fair	15/ nom
Madras ,,	Finger fair to fine bold	16/ a 17/6
Do. ,,	Bulbs ,, ,, [bright	13/ a 14/
Cochin ,,	Finger fair	14/ a 15/ nom.
	Bulbs ,,	12/ a 13/
VANILLOES— lb.		
Mauritius ... 1sts.	Gd. crystallized 3½a 8½a in.	11/6 a 16/
Madagascar ... 2nds.	Foxy & reddish 3½a ,,	11/ a 12/6
Seychelles ... 3rds.	Lean and inferior	11/ a 11/6
VERMILLION ...	Fine, pure, bright	2/9
WAX, Japan, squares	Good white hard	45/

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Ceylon Agricultural Society.

Memorandum by the Secretary.

Members are particularly requested to NOTIFY CHANGE OF ADDRESS, and also forward necessary instructions when leaving the Island, temporarily or permanently. Members who fail to NOTIFY THEIR INTENTION TO RESIGN from the Society will be held liable for subscription till such notification is received.

ENROLMENT of new members can take place at any time; but, the subscription being annual, no reduction on the rate can be made. Members joining later than January will be entitled to receive back copies of the "T. A." and other publications.

Full sets of "The Tropical Agriculturist" for 1906, 1907, 1908, 1909, 1910, 1911 & 1912, can be supplied to members on application.

Those wishing to join the Society can do so by filling up and forwarding appended form with a year's subscription—(Rs. 8 local; Rs. 15 foreign to).

THE SECRETARY, CEYLON AGRICULTURAL SOCIETY,

Peradeniya.

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CEYLON AGRICULTURAL SOCIETY.

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		From 1st. Jan. 19

Photo. by H. F. Macmillan.

Wickham Smoke Cure Apparatus at work at Henaratgoda. The drum is revolved by means of a handle operated by a man standing behind.